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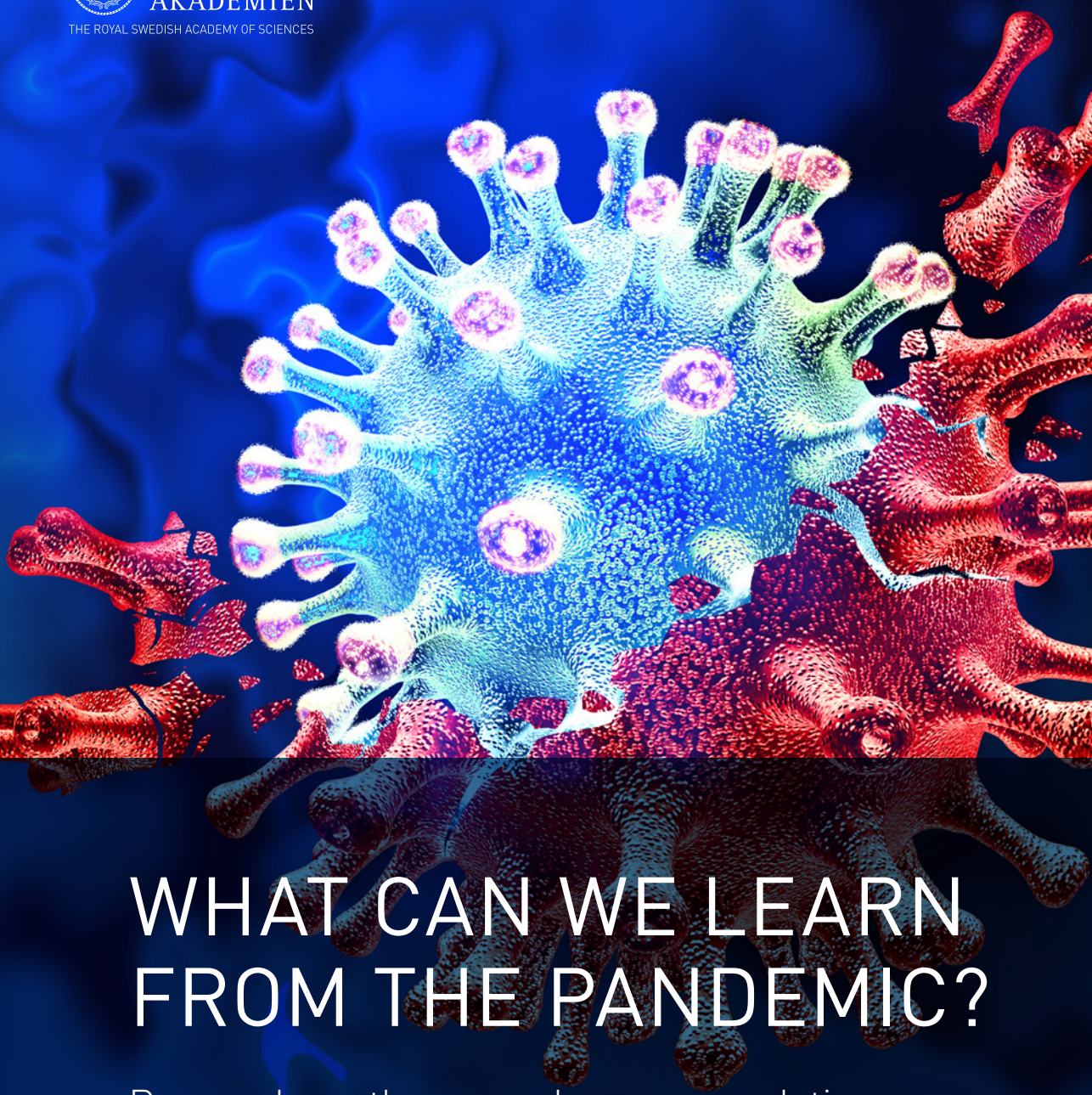

WHAT CAN WE LEARN FROM THE PANDEMIC?

Research syntheses and recommendations for the future – the Royal Swedish Academy of Sciences' Expert Group on COVID-19

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FOREWORD

The Royal Swedish Academy of Sciences' Expert Group on COVID-19 has produced a report that includes research syntheses for topics about the disease and about SARS-CoV-2, the virus that causes it. This text is a summary of the report's chapters and describes the conclusions of the Expert Group, the lessons learned and recommendations for dealing with future pandemics. The report is aimed at Swedish decisionmakers, opinion formers, journalists and the interested public with no medical training. The intention is to present knowledge relevant to the Swedish management of COVID-19 in an easily accessible manner.

The summary includes references to the various chapters of the main report. The main report is available in a digital version (in Swedish) and can be read on the Academy's website: www.kva.se/covid19slutrapport

TASK

In the autumn of 2020, the Royal Swedish Academy of Sciences appointed an expert group to review what was known about the SARS-CoV-2 virus, COVID-19 and its spread in the community. The Expert Group worked from November 2020 to November 2021, with the primary aim of illuminating the state of knowledge at the end of 2021, as well as the remaining gaps in our understanding of the virus and the disease. The Expert Group was also to investigate the lessons that could be learned about communicable disease control, vaccination and the treatment of COVID-19. Another task was to reflect on how cooperation between the scientific community, political powers, public authorities and healthcare services can improve in the future.

WORK PROCESS

The Expert Group has gathered knowledge via its members remaining up to date with the scientific literature in their areas. The emphasis has been on peer-reviewed publications in high quality journals, as well as other relevant publications such as editorials and the websites of organisations like the US' Centers For Disease Control and Prevention (CDC). Non-peer-reviewed studies and information from seminars and conferences have also been important in the interim reports

that were published as work progressed. This report includes results from scientific publications up to October 2021. The Expert Group's members have also continually gathered information from other researchers, infectious disease doctors and representatives for a range of organisations, nationally and internationally.

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The Expert Group's members are either members of the Royal Swedish Academy of Sciences or other leading researchers.

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The statements and reports issued by the Expert Group reflect the opinion of the Expert Group and should not be regarded as a statement from, or the standpoint of, the Royal Swedish Academy of Sciences as a whole.

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CONTENTS OF THE MAIN REPORT

This summary includes references to the following chapters in the main report (in Swedish), which is available on the Academy's website: www.kva.se/covid19slutrapport

SUMMARY, LESSONS LEARNED AND RECOMMENDATIONS

The Royal Swedish Academy of Sciences' Expert Group on COVID-19 has reviewed the research and research syntheses published during the 2020–2021 pandemic, drawing the following conclusions about Sweden's management of the pandemic. The Expert Group also provides recommendations for strengthening Sweden's contingency planning for future globally pandemic viruses.

1. Experiences from the ongoing COVID-19 pandemic

The assessment of the Expert Group is that the early control of infections at a societal level and the rapid implementation of measures for particularly vulnerable groups of the population are decisive in a pandemic's progression. Early and intensive measures to control initial infections, as well as continual monitoring and clear information to the public, provide the greatest chance of long-term control. The rapid establishment of testing, especially of individuals arriving from areas with known infections, as well as contact tracing for infected individuals, is particularly important. SARS-CoV-2 infection spreads exponentially, so a couple of weeks' delay in introducing measures can have a major impact on the spread of infection within a country. A brief period of societal lockdown may make it possible to control the transmission rate without the need to implement additional large-scale lockdowns, and also provide an opportunity to establish and improve treatment routines for the seriously ill. Stricter measures can then be used where clusters of infections are discovered.

Maintaining the lowest possible levels of infection is important in reducing the numbers of deaths and serious illness, and thus reducing pressure on society and the health services. Low levels of infection are also important in limiting the emergence of mutations with characteristics that make the virus more infectious or more likely to cause illness. Effective measures are required to achieve this,

and should include comprehensive testing of suspected infections, isolation of confirmed cases, contact tracing, and quarantine for people who have been exposed to infection. Respiratory infections are prevented most effectively by minimising the number of new contacts, primarily through physical distancing of at least two metres and through good ventilation when indoors. Studies have also shown that face masks reduce the spread of droplets from infected people and also protect the wearer from breathing in infectious aerosols. During the pandemic, many countries – but not Sweden – have required the use of face masks outside the home.

The risk of new pandemics has increased as a result of the high population densities and frequent global travel that characterise our modern society. Virus transmission is governed by human behaviour; the vulnerability of an open society to global pandemics has become apparent during the current SARS-CoV-2 pandemic. Implementing measures and providing clear and correct information to different population groups requires extensive cooperation between a variety of societal functions. To control the current SARS-CoV-2 pandemic and provide a high level of preparedness for future pandemics, we must improve national and international cooperation, particularly with regard to coordinating the actions taken.

Effective COVID-19 vaccines that provide a high level of protection against serious disease have been introduced, decisively changing the playing field in Sweden and internationally. Booster jabs will probably be necessary to achieve lasting protection, especially against new and more infectious variants, and particularly for vulnerable groups and healthcare staff with a high level of exposure. Very high vaccination coverage will be needed to effectively reduce the community transmission of SARS-CoV-2. Considerable efforts to achieve a high and even level of vaccination in countries with fewer resources will be critical to controlling the pandemic on a global scale. Rapid measures are necessary when infection rates rise, as are continued information campaigns about behaviours that will reduce the spread of infection.

2. Needs and recommendations for future pandemics from a Swedish perspective

The COVID-19 pandemic has demonstrated how rapidly and comprehensively our societies can be affected. New pandemics, caused by coronaviruses or other pathogens, are very likely to occur. Planning for future pandemics is thus vital. The Expert Group believes that making adequate preparations in pandemic "peace time" is essential, as this determines the potential for rapid mobilisation when a new pandemic emerges. Before a pandemic occurs, defining and meeting the need for equipment, training, research, care and healthcare, and cooperation is vital. During this period of preparation, a crisis plan should be developed, tested, rehearsed and adapted to how various actors could behave in a looming or established pandemic. Pre-existing communication channels should be ensured. During an ongoing pandemic, the crisis plan should be activated and continually updated as the situation evolves. Once the pandemic has resolved, the focus should be on evaluating, following up, learning and formulating needs for the future. This requires carefully designed processes and efficient coordination between different societal functions and disciplines. It also requires a research community with close international ties, which can assist with rapid analysis of the situation, and provide information about the pathogen's biological properties and its interaction with the human immune system and physiology.

THE FOLLOWING NEEDS AND PROPOSALS HAVE BEEN IDENTIFIED BY THE EXPERT GROUP:

1. A review of the need for appropriate dormant pandemic/civil contingencies legislation, which the Riksdag can activate at short notice.

2. Establishing a new pandemic plan that can be applied to different pathogens with pandemic potential. The plan should be preceded by an analysis of the necessary conditions for the principle of responsibility to function in all sections of society, highlight potential problems with this, and offer flexibility for alternative solutions.

3. A contingency plan for vital medicines, protective equipment, medical equipment, basic foodstuffs and other goods and services essential to maintaining life.

4. Ensuring that all actors who run public or private healthcare, care homes and home care have processes for implementing measures necessary during a pandemic, and the establishment of structures for their follow up.

5. Coordination between healthcare regions on epidemiology, communicable disease control, testing and vaccination. The establishment of a plan for coordination and the allocation of responsibility for diagnostics between regional laboratories, as well as a framework for international cooperation and knowledge exchange that can be mobilised in a pandemic.

6. Conditions for merging regions for communicable disease control should be investigated, creating fewer regions but with better expertise.

7. Strengthened international involvement in pandemic preparedness and management, such as in the WHO and the European Centre for Disease Prevention and Control, as well as expanded cooperation with our Nordic neighbours in the entire field of communicable disease control.

8. Long-term investments in basic and applied research in relevant fields of epidemiology, infection biology, immunology, vaccine research, psychology and the social sciences. Strong regeneration of young researchers and continually developing expertise. Stronger cooperation between clinical and academic research laboratories, as well as with research and development at universities and in industry.

9. An ethics committee with scientific expertise, to support politicians and public authorities in achieving the difficult ethical balance necessary during a pandemic.

10. Increased educational efforts in epidemiology and communicable disease control at all levels. Specific training and continuing education in the field of communicable disease control for people in management positions in organisations that are particularly affected by a pandemic. Specialist education in infection epidemiology for people working in regional communicable disease control units should be considered.

11. Information programmes that aim to achieve acceptance of measures that society may need to implement during a pandemic, and to increase vaccine acceptance. This may require extended research to obtain understanding about how to motivate people of different backgrounds to accept society's evaluations as regards vaccinations and measures to stop the spread of infection.

12. Long-term environmental work to improve indoor air quality, such as air purification and circulation. Future pandemics are also likely to be caused by pathogens that spread via aerosols.

13. A national recovery plan for healthcare and care staff to counteract mental illness and its effects on the Swedish healthcare system.

14. Incentives and resources should be created to address these areas in times of "pandemic peace". Sweden has several large regional laboratories with university links, so has great potential to be an international leader in pandemic pathogens, as regards method development, identification and characterisation.

15. **The Expert Group proposes** that Sweden establishes an independent expert unit with a high level of scientific expertise in relevant areas. The unit will provide the Government, responsible politicians and public authorities with updated scientific information and advice on pathogens, the spread of infection, measures for infection control, the implementation and harmonisation of testing methods, vaccination strategies and communication on these subjects.

16. **The Expert Group proposes**, for research important to pandemic preparedness, that the Swedish Research Council should receive an expanded mandate within the national research programme for viruses and pandemics. This will apply to coordination and targeted investments in both basic and applied research, and should also include the appointment of people to positions in infection biology, immunology and vaccine research, epidemiology and psychology (regarding people's crisis management and their motivations for protecting themselves and others). It should include funding for secure laboratories for infection research at universities and for expensive equipment, necessary for large-scale whole genome sequencing of microorganisms and their characteristics.

3. The coronavirus – disease and control

THE PROGRESSION OF PANDEMICS (SEE CHAPTER 2)

In modern times, viruses that are immunologically new to humans, and which spread via the respiratory tract, have caused pandemics with great morbidity and high numbers of deaths. They have all been caused by zooviruses that have adapted to reproducing in human cells. Different pathogens utilise different ways of spreading between people. The viruses that have great potential to spread rapidly around the globe are primarily those that spread via tiny droplets carried in the air, such as influenza viruses and coronaviruses. Since the start of the 20th century, the world has seen several influenza pandemics of varying severity, such as the Spanish flu in 1918, Asian flu in 1957 and the Hong Kong flu in 1968. Governments and authorities implemented very few epidemiological measures to prevent transmission. Therefore, as SARS-CoV-2 started to spread around the globe, there was limited knowledge about how physical distancing, lockdowns and personal protective equipment could influence the course of a pandemic. The potential for using previous experience has also been hindered by the fact that influenza viruses spread faster than SARS-CoV-2.

Like influenza, SARS-CoV-2 is primarily transmitted through aerosols, which are large or small droplets emitted when we cough or sneeze (SEE CHAPTER 3). Deep

breathing with powerful exhalation when speaking or singing can also create infectious aerosols. Transmission by people who do not display symptoms, or who become symptomatic several days later, respectively called asymptomatic and presymptomatic infections, has contributed comparatively more to the spread of SARS-CoV-2 than that of the influenza virus. This is probably because asymptomatic infection with SARS-CoV-2 is more common, and the incubation period from infection to developing symptoms is longer for SARS-CoV-2 than for influenza.

Children and young adults often become ill from influenza and promote the spread of the infection, but they are not affected by SARS-CoV-2 to the same extent. Elderly people often cope well with influenza infections, since they have an immunological memory of the virus from previous exposures. However, for an entirely new virus, such as SARS-CoV-2, the elderly are the most vulnerable to developing serious disease, because our ability to generate immune responses to new infections decreases with age (SEE CHAPTER 5). Numerous factors mean that the risk of infectious diseases spreading globally can be expected to increase in the near future; these include growing population density, more travel, deforestation and close contacts with wild animals. Climate change and increased resistance to antibiotics also drive the risk of pandemics occurring.

VIRUSES, VARIANTS AND THE SPREAD OF INFECTION

(SEE CHAPTERS 2 AND 10)

Coronaviruses are RNA viruses, which means that their genomes consist of RNA. They are found among many animal species without causing symptoms, but can lead to illness in new animal hosts. Bats are healthy natural reservoirs for many types of coronavirus. An unknown number of these can spread to humans, directly or via other host animals. Four coronaviruses that usually cause mild respiratory infections in people are known. In the 21st century, three new coronaviruses have caused outbreaks of Severe Acute Respiratory Syndromes (SARS). SARS-CoV and SARS-CoV-2 both originated in China. The virus that causes the Middle East Respiratory Syndrome (MERS-CoV) is from the Middle East, and still causes occasional cases of severe illness. The outbreaks of SARS-CoV and MERS-CoV were controlled through ill people and their infected contacts being isolated before the spread of the virus developed into global pandemics. Despite the SARS and MERS outbreaks, the pandemic preparedness of Sweden and the world thus remained primarily targeted on strategies designed for influenza epidemics. These were based upon slowing the spread of infection so the healthcare system and wider society did not collapse, a strategy likely to have been adopted due to the

belief that influenza pandemics were unstoppable because of the disease's high transmissibility. The original SARS-CoV-2 strain probably spread less effectively and more patchily than influenza. SARS-CoV-2 could thus have been more effectively constrained than influenza through measures to prevent and control its spread.

Like other RNA viruses, SARS-CoV-2 develops continually through changes to its genome. This happens particularly quickly when the virus has recently become established in a new host. More infectious virus variants, such as Alpha and Delta, infect human cells more efficiently that the original virus. These SARS-CoV-2 variants, with heightened transmissibility, have so far caused at least two global waves in the pandemic. A high level of global transmission increases the risk of even more infectious virus variants developing through viral adaptation. In October 2021, around 20 Delta subgroups were defined as requiring special monitoring. Variants may also arise that have partial resistance to the antibodies generated through previous vaccination or infection with SARS-CoV-2. The development of new virus variants can only be prevented by significantly reducing the virus' global spread.

CLINICAL PROFILE AND TREATMENT (SEE CHAPTERS 7 AND 11)

To infect human cells, SARS-CoV-2 attaches to a protein called ACE2 (angiotensin-converting enzyme 2), which is found on many of the body's cells. The infection starts in the mucous membranes of the upper respiratory tract and results in an influenza-like illness with a widely varying degree of severity. It can also affect the sense of smell at an early stage. In some patients, the infection later spreads to the lower respiratory tract, where it may cause a life-threatening condition with severe lung inflammation, the formation of blood clots and impact on multiple organs.

Of the individuals who had an acute infection, 10–15 per cent still have symptoms after three months. Post-acute COVID-19 syndrome, sometimes called long COVID (SEE CHAPTER 8), usually affects patients who have had a severe disease progression during the acute phase of the infection. They may suffer from breathing difficulties and fatigue for several months after the acute phase of the infection is over. People who have had mild or moderate symptoms while infected may also develop long-term and multi-facetted symptoms that include fatigue, breathing difficulties, poor oxygen saturation during exercise and postural orthostatic tachycardia. The mechanisms responsible for the latter form of post-acute COVID-19 syndrome are still unknown. Autoimmune reactions or undetectable amounts of virus remaining in the body are possible causes. Children seldom have severe symptoms of COVID-19 infection, but in rare cases they may develop a multi-inflammatory syndrome

that requires intensive care. The same syndrome occasionally affects adults.

Treatments for people with a COVID-19 infection have considerably improved over the course of the pandemic, and primarily include oxygen, anti-inflammatory drugs, treatment to prevent blood clots, assisted breathing and nutritional support where necessary. Numerous antiviral pharmaceuticals have been tested but, so far, the results show limited success. The development of pharmaceuticals to treat SARS-CoV-2 is an active field and several clinical trials for new medicine are underway. Additionally, effective biological antiviral pharmaceuticals have become available in the latter part of the pandemic. Monoclonal antibodies that block the SARS-CoV-2 virus from infecting human cells have become important in the treatment of some patient groups. In October 2021, the European Commission listed ten pharmaceuticals suitable for treating COVID-19; these will become available on the European market as soon as they receive approval.

VACCINES (SEE CHAPTERS 5 AND 6)

A range of vaccines for SARS-CoV-2 have been developed in a short period of time, tested for efficacy and safety, and been approved. That it only took one year from the start of the COVID-19 pandemic to produce and distribute effective vaccines is a major scientific success. Two of the most used vaccines, those from Pfizer/BioNtech and Moderna, are made from synthetic RNA, which controls the formation of the virus' spike protein. Other vaccines, including those from AstraZeneca and Janssen, use a harmless adenovirus to deliver the gene that codes for the spike protein. Both types are based on the body temporarily producing the spike protein and the immune system then reacting to it. Other vaccines, which have been approved in some parts of the world, include inactivated virus particles or purified virus protein. All the vaccines aim to stimulate an immune response to the spike protein, primarily through the production of antibodies that can block infection.

All the vaccines have been shown to provide extremely good protection against severe illness and death, but people who have received two doses may still have breakthrough infections. The more time has passed since being vaccinated, the greater the risk of waning levels of protection. Most breakthrough infections lead to a short-term, mild infection because the vaccination has trained the immune system to rapidly deal with the virus. In elderly people, however, breakthrough infections may sometimes lead to serious illness. In countries where the population was vaccinated early, the number of hospital admissions among elderly people has once again started to rise. Even now, in October 2021, Sweden needs booster doses to strengthen the immunity of elderly people and other vulnerable groups who were vaccinated in early 2021. We need to increase our understanding of the

protective effects of the different vaccines and how well their protection lasts in different age groups. It is also important to follow the development of the virus to know whether variants with partial resistance to antibodies are starting to spread. The Delta variant is currently dominant in Sweden and globally. The vaccines now available do offer protection from Delta but, because this virus is more infectious than the original virus, the issue of booster jabs is extremely relevant.

The best approach for stopping the ongoing pandemic and reducing the risk of new virus variants is to have effective vaccination programmes in every country in the world. It is of the greatest importance that we use international cooperation to achieve a high level of vaccine coverage worldwide. We also need to disseminate knowledge about how vaccines work to increase global levels of vaccine acceptance.

4. Experiences from Sweden's management of the ongoing COVID-19 pandemic

SARS-CoV-2 has spread around the world in an unpredictable and varied manner, although the effects of climate, demographics, vaccination coverage and measures in slowing transmission are now becoming clear. Countries have applied different strategies to reduce infection rates; the design of these strategies has varied depending on how the governing politicians have assessed the seriousness of the pandemic's development. Other factors that have played a role are a country's capability to implement measures and with what effectiveness, while legislation and systems of governance have been decisive in the limitations on personal freedom that countries have been able to demand of their population.

THE PRINCIPLE OF RESPONSIBILITY forms the basis of Sweden's civil contingency strategy (SEE CHAPTER 1). This is a principle in which the entity that is responsible for a particular activity when there is no crisis will also be responsible for contingency measures when a crisis occurs. This places great demands on all organisations in Sweden, as they must be prepared for pandemics and other emergencies. Appropriate instructions are necessary for an understanding of what is required, as are controls to ensure that measures are carried out. These basic requirements had not been fulfilled when the pandemic began. Most organisations were

therefore inadequately prepared, in terms of both knowledge and equipment. This was especially true for elderly care, where a lack of preparation contributed to Sweden's high mortality rate in the first stage of the pandemic. There was a lack of protective equipment, as well as of adequate insight into airborne infection and thus the need for face masks for all those in contact with elderly people. There was also little knowledge of the importance of providing good ventilation. The blame for these shortcomings cannot only be placed on individual care providers; the overarching responsibility for crisis management lies with the Government Offices of Sweden. The Government, and the Riksdag, must use legislation and public service agreements to ensure that the principle of responsibility is put into practice by public authorities, regions and municipalities. Before and during the pandemic, authorities at all levels failed in their support for, and supervision of, individual care providers. Care providers were frequently unable to take the responsibility expected of them for their clients' safety.

The principle of responsibility can also be said to apply to individuals. The Swedish strategy for communicable disease control places great demands on people's behaviour, but people require clear instructions if they are to take personal responsibility (SEE CHAPTER 4). If safe behaviours are to be maintained in the long term, frequent and well-reasoned reminders about these instructions are needed. Control mechanisms are also necessary. The Public Health Agency's information has been consistent as regards the basic recommendations to maintain physical distancing and stay at home if you have symptoms, but in other cases its information has been contradictory and one-sided. One example is its objection to the use of face masks, and its early dismissal of the risk that individuals with presymptomatic or asymptomatic infections could be infectious. There has also been a lack of control mechanisms for ensuring compliance with the restrictions. The allocation of responsibility under the legislation, with different principals being responsible for different activities, has also made it more difficult to push through consistent measures.

THE SWEDISH PANDEMIC STRATEGY was designed to deal with an influenza pandemic, using a strategy previously developed by the Public Health Agency on behalf of the Government*. Its aim was to minimise the number of people who became ill and/or died and to limit negative consequences for individuals and for society. The strategy chosen by the Public Health Agency was based upon "flattening the infection curve". Its purpose was to reduce the number of people

*https://www.folkhalsomyndigheten.se/contentassets/b6cce03c4d0e4e7ca3c9841bd96e6b3a/pandemiberedskap-hur-vi-forbereder-oss-19074-1.pdf

who were ill at any given time, reducing the load on healthcare services and society. Despite WHO and the European Centre for Disease Prevention and Control (ECDC) recommending that countries do everything they can to reduce the spread of infection, this goal was not part of the strategy presented by the Agency. The extensive morbidity and high mortality in Sweden during the first two waves of the pandemic were primarily due to the overly mild and tardy measures to prevent the initial spread of infection.

Early knowledge about the spread of the SARS-CoV-2 virus did exist. Chinese researchers had warned of global contagion as early as the start of February 2020, yet the Agency did not implement any measures to try to prevent travellers to Sweden bringing the infection with them from other countries.

EPIDEMIOLOGICAL MONITORING in Sweden was well prepared for the reporting of cases that were discovered once the Government had classed the disease as a danger to public health. However, the testing of potentially infected people was slow to start, and conditions differed between healthcare regions. At an early stage, the regions were poorly prepared for being able to test a major inflow of samples. The Agency also lacked the necessary laboratory capacity to rapidly establish testing of an adequate scope. The testing capability that was eventually built up outside the regional laboratories, including the use of universities' resources, was partially able to compensate for the lack of capacity at the Agency and in the regions.

The low testing capacity at the start of the pandemic may have led to an overestimation of the actual spread of infection in Sweden which, in turn, may have contributed to the Agency's decision of 12 March 2020 – that it was impracticable to try to limit infections using the preventive measures, as implemented early on by Denmark, Norway and Finland, among others, to reduce the rate of community transmission.

Routine sequencing of the virus' genome, monitoring that is important for knowledge of which virus variants are circulating in the community, also started late but eventually became satisfactory. Several other comparable countries were quick to establish good test and trace capabilities. Several countries also used contact apps and rapid diagnostics for both the virus and antibodies at an earlier stage.

THE HEALTH SERVICES had limited contingency planning for the pressure caused by the pandemic, particularly in intensive care services. The situation was extremely pressured in the first wave of the pandemic, being brought under control thanks to the heroic efforts of healthcare staff, as well as the decision to delay care that was not deemed acute. The number of patients with COVID-19 who died

decreased during the first year of the pandemic, thanks to healthcare services learning from the new experiences of care and medical treatment. Despite difficult circumstances, they handled this extreme situation well. However, staff exhaustion and the care and treatment backlog for patients with other illnesses whose treatment was delayed (SEE CHAPTER 9) are difficult consequences that largely remain to be dealt with. The effects of this healthcare 'squeeze' were significant during the first wave of the pandemic. The number of planned operations and treatments in Sweden fell by almost 50 per cent compared to the same period in 2019. In the second wave, November to December 2020, this squeeze was smaller. Compared to 2019, the number of physical healthcare contacts reduced significantly in 2020. Dealing with the backlog will require significant resources, in terms of staff and financing, over the next few years. Another major problem is the various types of long-term illness resulting from infection with COVID-19 (SEE CHAPTER 8).

PROTECTIVE EQUIPMENT AND TRAINING were inadequate. In the initial stage of the pandemic, Sweden was not able to provide enough protective equipment or training in communicable disease control for staff in healthcare and elderly care services. Unlike most countries in the world, the Swedish agency did not recommend that all care staff should use personal protective equipment, in the form of a face mask, in indoor environments where it was difficult to maintain a distance from patients. This was partly because protective equipment was not available at the start of the pandemic, but also because of the Agency's assessment of the character of the airborne infection and the effectiveness of face masks.

THE SWEDISH VACCINATION STRATEGY has worked satisfactorily, with some exceptions. When vaccines arrived, most regions established efficient immunisation routines relatively quickly. Increased national coordination and experience exchanges between regions are necessary to reduce the differences between them. For example, action is needed to reach out to areas with low vaccination coverage, such as targeted information and/or personal invitations for vaccinations. Another important measure is to make it possible for care providers to require proof of vaccination for everyone working in home care, elderly care and inpatient care. This would reduce the risk of increasing infection rates among people who are elderly or have long-term conditions this winter.

DEMOGRAPHICS AND OTHER SOCIETAL ASPECTS have been of great significance in the pandemic's impact and affected how countries have managed the spread of infection and illness. We have seen differences in the scope of the

pandemic and opportunities to slow transmission due to socioeconomic circumstances, such as how and where people live and travel, their level of education, language skills and how their working life is organised. These differences are also due to the openings allowed by legislation, as well as leadership and decision-making in public authorities and healthcare services, for example.

The Expert Group believes that expertise in numerous fields of knowledge outside medicine has not been adequately utilised before and during the pandemic. Expertise from more areas needs to be involved in the work to slow and manage future pandemics. Additional competencies are required to avoid unnecessarily severe illness and high mortality, but also regarding the economy and public health. During a pandemic, reductions in severe illness and deaths, including the consequences of delayed care, must be weighed against personal freedoms and the stress that a lockdown can cause. The Expert Group believes that there is a lack of deep ethical discussion about objectives and consequences in a pandemic situation. Such an ethical discussion is central to planning for the next pandemic. The potential to demand political accountability for how the pandemic has been managed must also exist. Laws must be complied with, but during the pandemic both infectious disease doctors and the Public Health Agency have been forced to obtain exceptions from the Communicable Diseases Act, because the huge volume of infections and cases of illness made it impossible to follow all the applicable rules on diseases that are dangerous to society. The Communicable Diseases Act should therefore be reviewed.

CONCLUSIONS ABOUT THE SWEDISH STRATEGY COMPARED TO THE STRATEGIES OF SOME OTHER COUNTRIES

The Swedish pandemic strategy has probably contributed to Sweden's considerably higher rates of infection, illness and death compared to Denmark, Norway and Finland (SEE CHAPTER 2). The Expert Group, based on what we know so far, believes that the Swedish pandemic strategy did not adequately consider limiting imported infections at an early stage. Nor did the strategy emphasise limiting local outbreaks or testing and quarantining people who had been exposed to infection. Nor did it recommend appropriate personal protective equipment. Elderly people in care homes were particularly vulnerable. The lessons learned in the first wave, with its high number of cases, were inadequate for dealing with the predicted second wave of cases. Very few of the lessons learned in other countries were applied in Sweden's management of the more infectious Alpha and Delta variants when they appeared.