The Academy of Medical Sciences has provided evidence and advice to Government throughout the COVID-19 pandemic, most notably through our two policy reports 'Preparing for a challenging winter 2020/21' and 'COVID-19: Preparing for the future (2021)'.[1,2]

There has been tremendous progress made to address COVID-19 and its impacts, from the development of vaccines to the rapid set up of and recruitment to platform trials. However, the virus still disrupts the lives of many in the UK and globally. This position paper outlines the Academy's views on what should be considered, both for COVID-19 and more broadly, as we proceed into winter and beyond. Our position has been informed by a series of roundtables held in April and May 2022 with experts, including patients and carers, and others involved in the development of our previous COVID-19 reports.

Prepare for the coming months

The COVID-19 pandemic put unprecedented pressures on health and care services, and the measures to address the virus have greatly impacted the economy.[3,4] While what many consider to be the 'acute' phase of the pandemic may have passed, the UK will still experience waves of COVID-19 alongside further challenges such as delayed care provision and increases in the cost of living. To minimise the wider impacts of COVID-19 on society this winter we propose a series of actions:

- **The UK Health Security Agency (UKHSA) should undertake or commission scenario modelling of COVID-19, influenza and RSV infections, hospitalisations and deaths ahead of winter. This should be informed by ongoing surveillance of infection rates, population immunity and behaviour.** Modelling of respiratory infections including COVID-19, influenza and RSV, and assessment of their combined impact alongside other winter pressures, is necessary to evaluate the scale of the potential challenges facing health and social care services ahead of winter. The modelling should be conducted annually to inform preparations for the delivery of services over the winter period.
- **Governments and the NHS in all UK nations should again prepare for a vaccination campaign for COVID-19 and influenza.** There is evidence of waning immunity to COVID-19, with cases increasing again in the UK and Europe, as well as increases in cases of influenza in the Southern hemisphere. We are pleased to see that prioritisation of the most vulnerable populations for vaccination is happening ahead of the winter period. This will help to reduce hospital admissions, deaths and possibly incidence of long Covid. Efforts should focus on strategies to improve vaccine uptake in high-risk groups with low coverage. Future vaccination strategies should be updated based on emerging evidence to ensure they remain cost-effective.
- **UKHSA, the Office for National Statistics (ONS), the NHS and others should continue with robust COVID-19 surveillance efforts.** The evolution of SARS-CoV-2 variants has created public health problems throughout the pandemic. Global surveillance capabilities, including genomic testing, are required

to identify new variants with increased transmissibility or pathogenicity. Close monitoring of Influenza-like-illness and Severe-acute-respiratory-illness will be necessary, with surveillance to identify circulating respiratory viruses, as well as hospital admissions, deaths and long Covid. This will rely on sufficient hospital testing capacity since free testing for the general population is no longer an option. Using surveillance data to provide short-term forecasts of health-care burdens should become routine.

- **Evaluation of the efficacy of behavioural and environmental interventions should be prioritised.** Several interventions to minimise the impact of COVID-19 were introduced during the pandemic, such as the wearing of face masks, self-isolation, school closures, care home restrictions and physical distancing. It will be necessary to understand the successes and trade-offs of these measures both individually and collectively to inform the effective use of interventions now and in the future e.g., if more pathogenic variants of concern or similar diseases emerge.

- **Governments in all UK nations should provide adequate resource for the NHS to tackle the backlog of care while adhering to infection, prevention and control measures.** There is evidence that hospitals running at occupancy levels of 90% and over leads to the decreased efficacy of infection prevention and control measures, ultimately reducing their resilience to cope with pandemics.[5] Operating at a maximum of 85% occupancy is considered appropriate for hospitals to deliver care while minimising the risk of nosocomial infections.[6] Hospitals and care homes can respond better to infection outbreaks and use their bed base more efficiently by increasing the number and proportion of side rooms and improving ventilation. Reporting of nosocomial COVID-19 infections, similar to that required for MRSA, may help to reduce infection rates by keeping health and care organisations accountable.

- **Support for the health and care workforce to minimise burnout and improve staff wellbeing is essential.** The COVID-19 pandemic has put considerable pressure on the health and care workforce as they cared for those with the disease while undertaking routine activity. In addition, health and care workers are more likely to contract severe COVID-19, and are more likely to report symptoms of long Covid.[7] More recently, emergency care has become increasingly burdened across England, with the South East reporting an increase in attendances to major emergency departments of 8.5% between the months of April and May 2022.[8] Pressures on primary care are again expected to intensify as winter approaches, particularly with vaccination efforts and increased requests for antivirals and support for those with long Covid. This presents further challenges for health care workers. Supporting the health and care workforce requires monitoring staff sickness, addressing vacancy rates, exploring the transfer or sharing of duties, re-employing retired staff and accelerated training.

- **Governments in all UK nations should provide clear guidance on the importance of ventilation in households, care homes, schools, workplaces and public spaces.** Adequate ventilation can reduce the transmission of SARS-CoV-2 and other airborne viruses without placing significant restrictions on individuals or business activities.[9] This is especially important throughout the winter as people socialise more indoors. Providing the tools and resources for spaces to be appropriately ventilated could prove beneficial, particularly when other precautions are not taken to minimise the spread of respiratory infections. The Royal Academy of Engineering report 'Infection resilient environments' explores the ways in which buildings can be designed to reduce transmission and risks of infection in the long term.[10]

- **Governments and the NHS in all UK nations should communicate timely, transparent, and easily understood tailored information to enable the**

public to make personal risk-benefit assessments. We heard from patients and carers that the removal of all legal measures to limit the spread of COVID-19 has left many feeling vulnerable, putting strain on their physical and mental health. Without such precautions, many are faced with difficult decisions to return to 'normal' pre-pandemic interactions, or risk developing severe disease. Providing information to assist the public in developing their own risk assessments (including the uncertainties) would enable individuals to make informed decisions to protect themselves and the people around them as much as possible. Communicating the benefits of vaccination, including promoting the understanding that vaccines have limited impact on the transmission of COVID-19 while providing protection from severe disease, should also remain a priority. Identifying individuals who are at lower risk of severe COVID-19 but consider themselves to be at high-risk is also important. Any communication requires the co-development of information with those most affected.

Prepare for the future

As the UK and other nations cycle through waves of COVID-19, there is a need to look beyond this single disease and identify ways of building resilience in the health and care system to tackle future health crises and challenges. Pandemics of other diseases will occur, and we must prepare for such shocks to minimise their burden on the health and care system and society more widely. Climate change and antimicrobial resistance will only exacerbate future health crises, as discussed in the Academy reports 'A healthy future: tackling climate change mitigation and human health together' and 'Antimicrobial resistance research: learning lessons from the COVID-19 pandemic'.[11,12]

To ensure the UK is equipped to tackle future crises it is necessary to:

- **Prepare for future pandemic(s).** The UK rapidly developed the infrastructure and processes necessary to research, diagnose, treat and vaccinate against COVID-19. Many of these successes were enabled by a well-funded research base in similar fields e.g., vaccine platform technologies and viral diagnostics, and existing infrastructure such as the NIHR Clinical Research Network that enabled the rapid investigation of treatments and vaccines. The coordination of resources and services around COVID-19 also played a critical role. There are several types of virus that pose a risk to human health and could lead to a future pandemic.[13] Research into viruses in animals and humans that pose the greatest risk is necessary to prepare for and limit the impacts of any future pandemics. It is vital that the systems and processes implemented to tackle COVID-19 are evaluated and, where appropriate, retained or evolved to address other infectious diseases more broadly, not just for pandemic response e.g., monkeypox.
- **Build a health and care system that is resilient to future shocks.** This includes investing in the NHS, social care and public health structures at both a national and local level. While the UK's response to the COVID-19 pandemic had many successes, the lack of resources available to primary care and public health structures prior to the pandemic may have limited the effectiveness and resilience of local public health responses. The 42 Integrated Care Systems in England and the new public health structures present opportunities for collaboration and, provided they are resourced with adequate workforce, bed capacity and other services, could help to build a system that it resilient to future health shocks. The use of remote or digital medicine where appropriate could provide an improved service of care and relieve some pressures, however, there is a need for further

evidence on their safety, efficacy and acceptability. Many patients and carers require additional support and resources to navigate these new systems.

- **Embed research in the health and care system.** The COVID-19 pandemic has showcased the NHS's ability to conduct complex trials and recruit large numbers of patients. Now more than ever the value of research has been demonstrated to the public and the willingness of patients to get involved in research should be capitalised on. Areas of particular importance are: developing antivirals and evaluating their use; understanding vaccination in immunocompromised individuals; and understanding and treating long Covid. Providing research opportunities has also shown to decrease the rate of burnout for health and care staff.[14] We have welcomed the addition of research in the Health and Care Act, however, ensuring staff have the skills and capacity to conduct research is central to embedding research and improving health services in the long term. The UK's research infrastructure should be maintained and developed to ensure all patients willing to participate in research are able to do so. The Academy has recommended ways of further embedding research in the NHS in our report 'Transforming health through innovation: integrating the NHS and academia' and is exploring this further in our latest working group on building a sustainable health research ecosystem.[15,16]

Developing policies to address COVID-19 and build resilience in the future health and care of the population must consider the needs of the most vulnerable groups (Box 1). As mentioned in our previous reports, to maximise the success of any interventions, policymakers should seek to **reduce inequalities**; **conduct meaningful public involvement**; ensure the timely **access and sharing of data**; and **collaborate globally** where possible. The International Science Council has recently published a report outlining how the global community can cooperate to handle major crises.[17]

Box 1: The challenges facing vulnerable groups

The pandemic has had a disproportionate impact on certain groups, including children, older people, people living in poverty and on lower incomes, and ethnic minority groups.[18] The economic impact of the pandemic and repeated lockdowns is likely to have longer-term negative health impacts for groups already experiencing structural inequalities. The needs of these groups must be prioritised when developing future policies related to health and care.

Children
Children of all ages, their families and/or carers have been adversely affected during the pandemic and continue to be following the 're-opening' of society. School and nursery closures particularly impacted education and social development, as well as mental health and wellbeing.[19] It is necessary to consider the risks and benefits of vaccination versus natural infection in children as further evidence emerges. There has also been a re-emergence of other viruses affecting children e.g., RSV and adenovirus, potentially placing pressure on paediatric health services.

Clinically vulnerable groups
The majority of deaths from COVID-19 have been in older adults and those considered clinically vulnerable.[20] Aside from the burden of COVID-19, those who are considered clinically vulnerable are more likely to have co-morbidities to manage, which impacts their access to care. There is also evidence of increased physical deconditioning and frailty in older people. Many of those who are clinically vulnerable have experienced isolation and loneliness, particularly those living in care homes which were closed to visitors. There is a need to balance the risk of infection from COVID-19 and other

diseases with the wider impacts on wellbeing e.g., from not interacting with loved ones. It is also important to recognise the variation in preferences for those who are clinically vulnerable to support them to 'live with COVID-19' in their preferred ways.

Socioeconomically disadvantaged groups
Rates of COVID-19 infection are higher amongst those living in areas of high deprivation due to crowded housing, less opportunity to work from home, and fewer financial and other resources to allow self-isolation if infected. Reflecting this and poorer pre-existing health, combined with more limited access to health care, they were four times more likely to die from the disease.[21] The lower rates of COVID-19 vaccination amongst socially disadvantaged groups, including fewer than 50% of those in Black, Black British and Pakistani groups, means that they have experienced a greater burden of disease than socially advantaged groups.[22,23,24] Addressing the underlying reasons for low COVID-19 vaccine uptake in these groups should be a priority.

People on low incomes also endured job and financial insecurity throughout the pandemic and are now faced with a cost-of-living crisis which will impact them further.[25] Providing sick pay or financial compensation would enable those in the lowest income households to self-isolate if they become infected with COVID-19 without any loss of income.

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