Addressing the challenges of the COVID-19 pandemic in low- and middle-income countries

Workshop report

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Opinions expressed in this report do not necessarily represent the views of all participants at the event, the Academy of Medical Sciences, or its Fellows.

All web references were accessed in August 2020.

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Preface

During 2020, a novel coronavirus, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), spread to almost all countries worldwide. Although less deadly than SARS-CoV-1, which killed at least 770 people in 2003/4 and had a mortality rate of around 11%, the novel virus is highly transmissible and causes a pneumonia-like disease, known as coronavirus disease 2019 (COVID-19), with a mortality rate of around 1%. By the end of June 2020, more than 10 million cases of COVID-19 and 500,000 deaths had been reported.

Since its emergence, different countries have seen the pandemic develop at different rates. The response to COVID-19 has also varied from country to country. With much still unknown about the virus, the disease it causes and how best to control it, there are important opportunities for countries to share experiences and learn from one another. This applies to both high and low- and middle-income countries (LMICs), the latter who face a range of issues affecting their capacity to respond to COVID-19.

To facilitate this exchange of COVID-19 information, the Academy of Medical Sciences (AMS) organised a four-day virtual meeting, focusing on the experiences of a range of LMICs as well as those in the UK. It included discussions in three key areas – public health, social and behavioural responses, and clinical care.

The workshop formed part of a programme of policy events organised by the AMS and supported by the Global Challenges Research Fund. It was chaired by Professor Guy Thwaites, FMedSci, Professor of Infectious Diseases and Director of the Oxford University Clinical Research Unit, Vietnam. Discussion groups were chaired by Dr Jaime Montoya, University of the Philippines and Member of the Philippines National Academy of Science and Technology (public health discussions); Professor Heidi Van Rooyen, Human Sciences Research Council and Member of the Academy of Science of South Africa (social and behavioural response discussions); and Professor Rosalind Smyth CBE FMedSci, Director of the UCL Great Ormond Street Institute of Child Health and Honorary Consultant Respiratory Paediatrician, Great Ormond Street Hospital NHS Foundation Trust (clinical care discussions).

This report provides a summary of the key themes to emerge at the workshop. It reflects the views expressed by participants at the workshop and does not necessarily represent the views of all participants or the AMS.

Executive summary

Declared a global pandemic by the World Health Organization (WHO) in March 2020, COVID-19 has swept across the world, the epicentre of the pandemic shifting sequentially from East Asia to Europe and to the Americas. Because of these pandemic dynamics, different countries are at different stages of a COVID-19 epidemic, and countries have varied markedly in how well they have controlled the disease. While a complete understanding of these differences is still to be established, enough is already known for key lessons to be learned, and to inform the next phases of COVID-19 control.

COVID-19 has affected almost every country in the world, high-income countries as well as LMICs. Notably, middle-income countries in Asia and Latin America were among those most affected in the early months of the pandemic, and have achieved decidedly different successes in controlling the spread of the virus. LMICs face a number of challenges that are likely to affect the course of the COVID-19 epidemic in their countries and the effectiveness of public health control measures, but some also have valuable experience in dealing with previous outbreaks, including SARS-CoV-1.

To encourage the sharing of experiences and the identification of key unanswered questions, and to explore how evidence has been used to guide pandemic responses, in June 2020 the AMS organised a four-day virtual meeting with participants from a range of LMICs in Africa, Asia and Latin America, as well as from the UK and USA, focusing on public health, social and behavioural responses, and clinical care. Key themes to emerge from the meeting were:

- **International interdisciplinary collaboration:** Participants emphasised the importance of sharing data and experience, and of collaborative research efforts to close key evidence gaps. The need for interdisciplinary collaborations and early and ongoing involvement of social and behavioural scientists in country responses was stressed.
- **Innovation and adaptation:** While fundamental principles of infectious disease control and epidemiology need to be followed, there is considerable scope for innovation to increase their effectiveness. Innovation could be based on new technologies, but community resourcefulness and adaptation may also be an important 'bottom-up' source of innovation.
- **Leadership, evidence and trust:** Effective responses to COVID-19 have been based on timely, well- organised and integrated government-wide responses informed by scientific advice. Public trust has been a critical component of adherence to COVID-19 control measures, and scientists have acted as important independent and trusted sources of information.

Immediate responses to the COVID-19 pandemic have typically been universal and centrally imposed. During the next phase of the pandemic, COVID-19 responses need to be more contextually sensitive, more consensually developed with community input, and more integrated with a wider range of health and social issues. Scientists from multiple disciplines have key roles to play in the generation of evidence to support the development of these more nuanced control strategies, alongside continuing engagement with policymakers and communication with the public.

Introduction

COVID-19 was first detected in Hubei province, China, in late 2019, and by February 2020 had spread to a range of countries, including hotspots such as Italy and Iran. Soon after, WHO declared COVID-19 a Public Health Emergency of International Concern (PHEIC) and then a global pandemic.

In the subsequent months, most if not all countries were affected by COVID-19. However, the timing, scale and trajectory of outbreaks have varied markedly between regions and between individual countries. In part, this has reflected the different approaches taken to control the disease, as well as factors such as international connectedness, national demographics and local climate.

SARS-CoV-2 is a new pathogen, and the world has been urgently investigating its biology, epidemiology and clinical impact. It differs significantly from SARS-CoV-1 in its clinical effects, as well as from influenza, which had been widely assumed to be the most likely cause of the next global pandemic. Genome sequences have been rapidly generated and shared, and diagnostic tests developed to detect current and past infections. Multiple initiatives have been launched around the world to develop a SARS-CoV-2 vaccine, and individual countries and WHO have launched clinical trials to evaluate potential treatments.

However, infectious diseases are not new, and well-established public health approaches have been adopted (to varying degrees) to control the spread of infection. These have included lockdowns, social distancing, isolation of suspected cases and other infection prevention and control practices, mask wearing, restrictions on national and international travel (including quarantining), and test, track and isolate strategies.

It is indisputably true that these measures – mostly imposed by central governments – have successfully curtailed outbreaks in many settings. However, they have been applied to different extents in different countries, and have achieved different results. Furthermore, by shutting down many aspects of everyday life, they have had an enormous social and economic impact, as well as other health consequences. Blanket lockdowns are therefore not a sustainable long-term strategy.

With so many unanswered questions, and with countries at markedly different points in the epidemic trajectory, there is much to be gained from the sharing of experience and information. In particular, COVID-19 presents specific challenges to LMICs which may have underdeveloped health systems and economic vulnerabilities; however, they also have greater experience of dealing with outbreaks of emerging diseases. In addition, COVID-19 has raised important questions about how evidence informs decision-making and the role of scientific advisers.

To explore these questions, the AMS' four-day virtual meeting focused on the experiences of a range of LMICs. For the three key areas of COVID-19 response that were covered (public health, social and behavioural responses, and clinical care), there were three two-hour discussion groups on consecutive days, followed by a three-hour feedback and plenary session. Key points from the discussion groups are summarised below, and more detailed information can be found in the annexes.

Main sessions

COVID-19 response

Participants noted that national COVID-19 responses have generally been based on coordinated action to control the spread of infection and to prepare health systems for an anticipated surge in cases of respiratory disease. It was suggested that control of the spread of infection has been most effective in countries that have seen strong adherence to social isolation measures and that have effective track, trace and isolate systems. Clinical care has evolved as new treatments have been evaluated, and with the growing realisation that SARS-CoV-2 has multiple effects, including on the circulatory as well as the respiratory system.

It was also noted that countries are increasingly facing the challenge of moving from blanket social restrictions to more targeted responses, and of managing the longer-term direct effects of SARS-CoV-2 infections and the indirect consequences of COVID-19 responses. Specific issues for LMICs include quarantine challenges in densely populated urban and peri-urban settings and achieving social compliance with lockdowns in low-resource communities with limited or no social security support.

A range of important enablers of effective responses were identified, including decisive political leadership, rapid coordinated action across governments, high levels of public support for government measures, and a sense of social solidarity ('we are all in this together'). Responses have typically involved strong and innovative public health messaging, often underpinned by social and behavioural science. In most countries, advisory groups of scientists have informed policy responses, although it was suggested that their influence varies from country to country and that not all relevant scientific disciplines have always been appropriately represented.

Facilitating COVID-19 research

Across the three discussion groups, participants identified a range of factors that could facilitate or impede COVID-19-related research. **International multidisciplinary consortia**, with strong involvement of LMICs, were seen as critical in understanding the biology and epidemiology of COVID-19 and in developing and assessing interventions. It was suggested that national academies could play a key role in facilitating the development of these consortia. Online networks could also play an important role in bringing together researchers with common interests from different countries.

It was felt that the principles of **'open science'** should be adopted, including timely sharing of data and open access publication of findings. Many funding bodies had launched 'rapid response' calls, some of them focused on supporting international collaborations, and the research community had responded in both developing bids and assessing them against short timeframes. These approaches, as well as the speedy ethical and regulatory review of proposed studies, should be refined and encouraged to expedite research. There was also felt to be scope in using innovative clinical trial designs, such as **adaptive trials**, to maximise flexibility and efficiency.

The particular research funding problems faced by **middle-income countries** was also raised. Such countries are often not eligible for the donor support provided to LMICs for capacity building and research, yet may have limited domestic resources to invest in research.

Facilitating the translation of evidence into policy

Across the three groups, participants identified several factors that could facilitate the translation of COVID-19-related research into policymaking. It was recognised that formal **advisory groups** are an essential source of independent scientific advice, and that they require **diverse expertise** to cover the many different aspects relevant to COVID-19 control, including social and behavioural scientists. It was suggested that such researchers need to maintain visibility, for example through public commentary, and ensure that their input is in a form that can readily be used by policymakers.

Modelling was felt to have a key role to play in simulating epidemics and in assessing the potential impact of policy interventions, and has had a strong influence on policy in many countries. Ensuring policymakers are closely engaged with research at early stages was seen as critical, with efforts made to convert policy concerns into research questions. Establishing **country-led research agendas** along with organising local studies (with the support of international partners), was identified as a way to increase the likelihood that findings influence policymaking. **Regional collaboration** and harmonisation could also be an efficient way to collect policy-relevant data.

Ensuring that appropriate data are collected and that researchers have timely **access to key data sources** were also seen as vital. Finally, it was noted that past responses to outbreaks and emerging infections were an important source of evidence and experience that could be applied to the COVID-19 pandemic.

Key themes

The three sessions identified a number of common themes that would facilitate more effective responses to COVID-19, the generation of evidence to inform control efforts, and the translation of evidence into policy and practice.

Global collaborative responses

It was repeatedly emphasised that global collaboration is essential. COVID-19 is a new threat to human health, with many unknowns. The sharing of information enables countries to learn from each other, and to identify and apply effective control measures and treatments. Several LMICs have gained valuable experience dealing with the SARS-1 and Middle East respiratory syndrome (MERS) outbreaks, which may have facilitated their rapid and effective responses. Given that several LMICs have achieved remarkable success in controlling COVID-19, this is a situation where high-income countries have much to learn from LMICs.

Participants also recognised the importance of collaborative research efforts to address unanswered questions. The need for interdisciplinarity was also stressed, including greater involvement of social and behavioural science to address public health questions. Social scientists need to be involved early, to inform the development of interventions, rather than being called upon to save failing initiatives. Given the urgency of the situation, this may require social scientists to adopt a more policy-oriented mindset and more rapid research methods.

Openness and the sharing of data were seen as vital for understanding COVID-19 epidemiology and for addressing key questions. Given the difficulty of preventing the spread of infections across national borders, international cooperation is in everyone's best interests – if one country is affected then all countries are. Participants argued that this mutual dependence, as well as ethical considerations of global solidarity, should underpin global efforts to ensure equitable access to new interventions, particularly COVID-19 vaccines. It is a principle of the ACT-Accelerator (www.who.int/initiatives/act-accelerator).

Innovation and adaptation

It was stressed that innovative new approaches were needed to combat COVID-19. The core principles of COVID-19 control – case and contact identification and isolation – are many decades old, but there is considerable scope to be innovative in the application of public health strategies. Social media and other digital tools offer new opportunities for public health messaging, and innovative public communication through the arts, music and other influencers has been adopted in many countries. Moreover, a deeper understanding of effective public health messaging has been developed in recent years, and can inform the development of interventions.

Participants also argued that inspiration should be sought from communities themselves, as they adapt and innovate to mitigate the impact of COVID-19. Examples include local approaches to the design and production of face masks, as well as the identification of community sites for social isolation. Communities themselves may therefore be the origin of imaginative, culturally acceptable and effective approaches to COVID-19 control.

A key theme to emerge was that the world is moving away from rapid, blanket, 'one-size-fits-all' responses such as population-wide lockdowns to **more nuanced disease-control strategies**. With more time available, there are opportunities to gather and use local evidence to inform the development of more tailored and context-sensitive responses strategies.

Participants also noted that COVID-19 has shone a spotlight on **health inequities**. In most settings, socially disadvantaged populations have been the worst affected by COVID-19. This is likely to be a reflection of a complex mix of biological and social factors, including social environments that aid the spread of infections, employment in high-risk occupations, economic challenges associated with isolation, and socially patterned comorbidities. Participants argued that COVID-19 responses need to take account

of these inequities, but also that longer-term attention is needed to be given to addressing wider deep-seated health inequities.

It was also suggested that there is a need to take a more **integrated view of COVID-19 and other health services.** There is concerning evidence that COVID-19 is drawing healthcare resources from other areas and discouraging healthcare-seeking behaviour, such as the take-up of vaccination services. There is a need to achieve a better balance between the benefits of COVID-19 control and the harmful effects of control measures (such as economic damage, mental health harms and impacts on health-seeking behaviour)

Leadership, evidence and trust

Most participants felt that their governments (with some notable exceptions) had shown a willingness to listen to scientific advice, with modelling studies being particularly influential through highlighting the potential impacts of the absence of action. Existing or newly-established advisory committees and task forces had played a key role in ensuring that responses were, as much as they could be for a new infection, evidence-based and that new evidence, as it emerged, was integrated appropriately into policy.

Participants also felt it was important that scientists retained a position of trust, by maintaining their independence, being driven by evidence, and being prepared to speak uncomfortable truths to political leaders. While a close relationship between scientific advisers and politicians can facilitate communication and the rapid translation of evidence into policy, too close a relationship can threaten the independence of scientific advisers and their position as dispassionate expert voices. It was suggested that professional bodies, including academies, could provide an important role, particularly in settings where dissent from national policy could be professionally damaging to individuals.

Statements such as 'following the science' may disguise the uncertainty associated with science and the importance of robust debate. This has, in some cases, blurred the distinction between advice and action – advisers advise (and that advice may not represent a unanimous consensus of scientific opinion) and decision-makers decide, based not just on scientific advice but also on other factors, and it is the policymakers who will ultimately be held accountable for their decisions.

Participants noted that the most successful responses to COVID-19 have been based on effective political leadership, with rapid action coordinated across governments. Some countries face the challenge of devolved political systems, which can be an obstacle to consistent national responses, but also allows sub-national authorities to tailor approaches according to local circumstances, in some cases making up for deficiencies in nationally-led responses.

It was suggested that, in some countries, lockdowns have been enforced with considerable vigour, although public compliance in most settings has been remarkably high. Even so, adherence has been dependent on the public's trust in the authorities and can be undermined by a loss of trust and the economic impact of lockdown on individuals.

However, it was noted that these approaches are not sustainable. They are too economically damaging and lead to 'lockdown fatigue', with negative impacts on mental wellbeing. Most countries have therefore entered a post-lockdown phase, although one in which some restrictions still remain. This creates a significant political and public health challenge, with the need for more complex messaging and a less directive approach that shifts responsibility for disease control more onto individuals and communities.

An opportunity therefore exists to move from unidirectional, centrally imposed strategies to more consensual and collaboratively developed approaches. **Community engagement** offers the potential to understand attitudes and responses to control efforts to date, the impacts on individuals, and future priorities. It provides a chance to consider COVID-19 control among other health and social priorities. Community engagement has the potential to feed into the design of interventions, ensuring they are culturally acceptable and therefore more likely to be successful. It also offers the opportunity to draw inspiration from community innovation and to mobilise communities and community organisations in the implementation of responses.

Conclusion

Some countries have achieved great success in controlling COVID-19. It is essential that lessons are learned from these efforts – to ensure a more effective response to both COVID-19 and future pandemics. Countries have been affected at different stages of the pandemic, and those who were among the first to be affected had to rapidly develop strategies for control, clinical management and risk mitigation. As more is learned about the virus and how to control its spread, countries have the opportunity to incorporate the latest thinking into response plans.

Global collaboration is seen as critical to limiting the impact of the COVID-19 pandemic. If COVID-19 persists in individual countries, it continues to pose a threat to other countries and to global health security. The sharing of data and experience will help to identify and encourage the uptake of evidence-based best practice. Global research collaborations can help to identify priority research questions and carry out multicentre international studies to close evidence gaps. In particular, many LMICs share specific factors that impact on COVID-19 responses, highlighting the importance of collaboration across the Global South.

As COVID-19 control to date has been mainly based on **social and behavioural responses**, these efforts need to be **interdisciplinary**, to ensure that the full range of scientific perspectives informs decision-making. Even when new medical interventions such as vaccines hopefully become available, a social and behavioural perspective will continue to be important to understand how they fit within broader disease-control strategies and to address specific issues such as adherence and hesitancy.

The next phase of the pandemic response will therefore be more complex and adaptive. It will be characterised both by a lack of knowledge in certain areas and information overload in others as the amount of published information on COVID-19 continues to grow. Scientists have a critical role to play in generating and synthesising information, informing policymakers and the public, and in managing expectations.

Annex 1: Public health responses

Public health strategies have primarily been based on quarantine and isolation approaches, backed up by testing for diagnosis and surveillance. Healthcare system capacity and staffing levels have been enhanced to cope with expected surges of cases.

Typically, national scientific advisory committees and task forces have been established to inform policy. In some cases, legislation has been enacted to support emergency actions. Responses have generally been coordinated across government departments and been associated with a significant mobilisation of resources.

Multiple questions remain unanswered, including around the transmission dynamics of COVID-19 and which public strategies are most effective at controlling transmission. Understanding the interplay between COVID-19 and other infectious and non-infectious diseases is essential for identifying vulnerable individuals and populations, while clarifying long-term protection and the immune correlates of protection following infection are key to determining future individual susceptibility and the potential for herd immunity.

For all countries, balancing public health measures and economic impacts is a major challenge, but this is particularly the case in resource-constrained settings. Practical challenges include the choice of diagnostic in a crowded marketplace, as well as how best to organise surveillance to detect a resurgence of cases.

The development of a COVID-19 vaccine would be a great boost to disease-control efforts. However, it is also likely to raise a range of questions, such as how best to deploy a vaccine and public acceptance. Ensuring equitable global access is a further key question.

Common challenges to public health responses have included limited health system capacity, the impact of other health conditions, and inequitable access to health services. Access to reliable data has also often been an issue. WHO's limited ability to influence national public health responses has led to considerable global inconsistency, leading to public uncertainty and misconceptions.

Effective public health responses have been dependent on well-coordinated national and local policies and actions, backed up by appropriate legal frameworks and encompassing all government departments. The use of evidence in policymaking has been facilitated by scientific advisory groups and task forces, influential modelling studies highlighting the potential impacts of inaction, and effective information systems. A political willingness to listen to scientific advice has been essential.

Challenges have included the rapid pace of change and considerable scientific uncertainty, limited access to funding for research in middle-income countries, and a variable degree of preparedness for outbreaks.

Annex 2: Social and behavioural responses

Most of the public health responses to COVID-19 have included a social and behavioural dimension – from social distancing to handwashing and mask wearing. Evidence from social and behavioural sciences has influenced the imposition of lockdown measures, for example by informing public health messaging and stressing the need for social and mental health support for patients, healthcare workers and other vulnerable groups.

Effective social and behavioural responses have been facilitated by high levels of public support for government measures, trust in authorities (which has diminished over time in some settings), and a sense of social solidarity ('we are all in this together'). Communication by trusted and respected groups, such as health workers, has proven influential. Public health messaging has often been strong, with effective use of the media, evidence-informed communication strategies, the creative mobilisation of influencers, and the use of new digital technologies. Particularly in large countries, decentralised approaches, tailored to local contexts, have proven effective.

Civil society has also often stepped in to play a major supportive role, for example to address food security issues or to offer mental health support. 'Bottom-up' innovations have included the identification of suitable quarantine spaces in the community, while shifts in social norms, such as not spitting in public, have also been seen.

Major challenges have included practical issues related to lockdown in crowded urban environments, as well as economic impacts on households that have made adherence to lockdown difficult. Lockdown can have significant negative psychological impacts and increases the risk of interpersonal violence. Policing of lockdowns has raised issues, with most authorities having little experience in enforcing lockdown and some countries have adopted highly authoritarian responses.

Stigmatisation has led to attacks on people with or suspected to have COVID-19 infections, and may have deterred health seeking. Misinformation and 'fake news', particularly spread by social media, has also had some damaging impacts.
Other challenges have included divergent guidelines, particularly in countries with devolved health systems, haphazard political responses and a lack of prioritisation and coordination, harsh crackdowns and disregard for human rights, and shortages of the resources needed to organise effective responses. A lack of evidence in certain areas, such as on the benefits of mask wearing, has stimulated much discussion. Often, behavioural and social sciences have been sidelined, with emphasis mainly given to biomedical solutions.

Key unanswered questions include what the potential impacts of measures such as lockdown are on young children and unborn children, as well as the longer-term mental health impacts across societies. Lessons could be learned on which are the most effective components of complex public health and behavioural interventions and be used to guide future responses.

It will also be important to determine how COVID-19 has affected other health-seeking behaviours and behaviours that impact on health (such as substance misuse). There are also opportunities to learn about the influence of age and other sociodemographic factors on behavioural responses, and how behaviour change can best be influenced in these groups.

Other key unanswered questions include how best to contextualise responses for different settings and populations, and how to integrate and balance COVID-19 responses with other health services. There are opportunities to explore and learn from community adaptations and resilience, as well as the effectiveness of different types of communication and behavioural messaging.

Other important themes include the impact of social determinants, including ethnicity and social disadvantage, on health behaviours and health impacts.

The rollback of lockdown is proving challenging, as simple emergency messaging is replaced by more nuanced communication. A key evidence gap is what is the most effective way to manage these rollbacks, and how to reimpose national or local lockdowns following a spike in cases.

Annex 3: Clinical care responses

The clinical response to COVID-19 has been multifaceted, and has evolved rapidly as more has been learned about the virus. A key goal has been to ensure that the capacity of health systems is not exceeded. Typical early health systems-oriented approaches included building critical care capacity and healthcare worker skills to cope with the expected surges of severe respiratory disease, as well as the suspension of routine procedures and the identification of alternative healthcare facilities (for example in the private sector).

Community-based approaches have also been developed, such as the creation of 'virtual hospitals' and community quarantining of positive cases. New diagnostic and admission protocols have been developed to facilitate effective patient management, in some cases with triaging of patients when critical care capacity has been exceeded.

In recognition of the diversity of COVID-19's effects, an important shift has been a move to more personalised treatments, including the differentiation of different types of respiratory distress and the use of new algorithms to predict the risk of deterioration.

Given the lack of knowledge and the urgency of the situation, clinical approaches and pathways have generally been developed at a local level. Some technical advisory groups have been established and rapid evidence reviews undertaken. Many countries have successfully launched clinical trials, either nationally or as part of global efforts such as WHO's Solidarity trial. A challenge for countries that have effectively controlled COVID-19 is a shortage of patients to enrol in trials.

The mainstay of clinical interventions has been oxygen therapy, with intubation in severe cases. Prone positioning of patients has proven beneficial. Dexamethasone and other steroids have been used in severe cases, as well as antibody treatments such as tocilizumab to address damaging immune activation (a 'cytokine storm'). A variety of other drug treatments are being tested, including hydroxychloroquine and antiviral drugs such as remdesivir. Building on the experience of haemorrhagic fever treatment, the use of convalescent plasma is also being evaluated.

Patient care also focuses on the management of comorbidities such as diabetes, which increase vulnerability to COVID-19. Increasing attention is being paid to the prevention of blood clots through the use of anticoagulants, with a growing recognition that COVID-19 is a multi-organ condition.

Key knowledge gaps include when should anticoagulant use begin, as well as the choice of drug, dose and duration. Similar questions surround the use of immunomodulators, and the timing of dexamethasone or other steroid use. Distinguishing the different causes of respiratory distress, such as pneumonia and pulmonary infarction, is an important challenge, particularly in settings where lung ultrasound but not CT is available.

Questions also remain over the best approaches to oxygen therapy (e.g. high-flow oxygen versus continuous positive airway pressure, or CPAP) and when to switch to mechanical ventilation. How to minimise long-term complications, such as lung damage, is also unclear. Home-based triaging methods to identify at-risk patients were also seen as important.

Other important issues include the efficacy of convalescent plasma and drug treatments, identifying the genetic factors that contribute to poor outcomes (including in children), and the potential protection offered by the BCG vaccination. A goal for health services research is how best to integrate COVID-19 management with other essential services.

Annex 4: Participant list

Name	Organisation
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Annex 5: Steering committee

Workshop Chair

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