NSW Health

Public Health – NSW COVID-19 Response

This report is a component of the report *As One System: The NSW Health system's response to COVID-19 (2023)*.

NSW GOVERNMENT

NSW MINISTRY OF HEALTH
1 Reserve Road
St Leonards NSW 2065
Tel. (02) 9391 9000
TTY. (02) 9391 9900

SHPN (CEE) 220757
ISBN 978-1-76023-308-2

Suggested citation: *Public Health – NSW COVID-19 Response*. Population and Public Health Division. Sydney: NSW Ministry of Health, 2023.

April 2023

Key contributors to the development of this report from the NSW Ministry of Health are:

Dr Andrew Milat, Julie Letts, Dr Robyn Newson, Ashleigh Armanasco, Alexander Willems, Dr Caroline Sharpe, Aurysia Hii, and Kristy Goldsworthy

The authors would also like to acknowledge the contribution of the NSW Public Health Response Debrief Advisory Group including:

- Dr Shopna Bag, Director, Population Health, Western Sydney Local Health District
- Dr Kerry Chant (Chair), Chief Health Officer and Deputy Secretary, Population and Public Health, NSW Health
- Mr Stewart Dowrick, Chief Executive, Mid North Coast Local Health District
- Ms Joanne Edwards, A/Deputy Secretary, Patient Experience and System Performance, NSW Health (former Deputy Controller, State Health Emergency Operations Centre)
- Dr Marianne Gale, Director, Population and Community Health, South Eastern Sydney Local Health District
- Ms Julie Letts, Public Health Response Debrief Manager, Secretariat to Advisory Group, NSW Ministry of Health
- Mr Graeme Loy, Chief Executive, Western Sydney Local Health District
- Dr Jeremy McAnulty, Executive Director, Health Protection NSW
- Dr Andrew Milat, Director, Evidence and Evaluation, Centre for Epidemiology and Evidence, Public Health Response Debrief Lead, NSW Ministry of Health
- Dr Caroline Sharpe, Senior Medical Advisor, After-Action Review Project Lead, NSW Ministry of Health
- Ms Priscilla Stanley, Manager, Health Protection, Western NSW Local Health District
- Ms Amanda Stephinson, Director, Communications, NSW Ministry of Health
- Ms Geraldine Wilson-Matenga, Executive Director, Centre for Aboriginal Health, NSW Ministry of Health

Foreword

A message from the Chief Health Officer and Deputy Secretary,
Population and Public Health, Dr Kerry Chant PSM AO

The global COVID-19 pandemic has been hugely challenging for societies around the world and has demanded responses unprecedented in modern times. In NSW, a public health response like no other in our history was mounted. Given the magnitude of these events, it is critical we learn from our experience.

This report is the result of a comprehensive debrief process. It reflects specifically on the public health aspects of the NSW Health COVID-19 response to identify best practices and areas that require strengthening, and to provide implementable recommendations for a stronger and more integrated public health network now and into the future.

Since the emergence of COVID-19 in Australia in early 2020, the NSW public health response along with the State Health Emergency Operations Centre (SHEOC) have been core parts of the NSW Government response to the pandemic. I would like to acknowledge our SHEOC colleagues who have delivered such vital work, particularly in the areas of testing and vaccination. Together, our teams have been instrumental in keeping our community safe during the pandemic.

The public health response has drawn on the collective efforts of the NSW public health network, including the Ministry of Health, local health districts, and many teams and agencies within and beyond the health system, to limit transmission of COVID-19 in NSW and help the community stay safe.

I am proud to lead such talented and dedicated teams. Throughout the pandemic this included thousands of personnel who came from other parts of the health system, government agencies, universities, other sectors, and the Australian Defence Force to join the surge workforce, working side-by-side with our public health professionals for the good of the NSW community.

I would like to thank all our colleagues and partners for their support. This report showcases the commitment, collaborative spirit and ability of public health teams to innovate under enormous pressure.

When reflecting on the pandemic response, I am enormously grateful for the ongoing efforts of the community in challenging times. Time and again the community went above and beyond to keep themselves and each other safe. It is only in this context that any public health response can be successful. We will continue to listen, learn, reflect and innovate to ensure we are doing all we can to deliver the very best possible outcomes for the people of NSW.

I am committed to implementing the recommendations from this report, and implementation planning is already underway.

Dr Kerry Chant AO PSM
Chief Health Officer
Deputy Secretary Population and Public Health
NSW Ministry of Health
NSW Health

Contents

Executive summary

The global COVID-19 pandemic has had enormous impacts on societies around the world. In NSW, a public health response of an unprecedented scale and duration was mounted in January 2020. Given the magnitude of these events, it is critical we learn from what was done well and where there is room for improvement.

This report reflects specifically on the public health aspects of the NSW Health COVID-19 response. The 104 recommendations in this report reflect the major themes identified through a multi-method debrief process that engaged over 250 people across NSW Health and partners.

1 Context and purpose of the debrief

Context

Two structures were established by the NSW Ministry of Health to direct the health response to the pandemic. Both were set up using an Incident Control System, an emergency management structure designed to perform the functions of control, planning, operations and logistics.

- The Public Health Emergency Operations Centre (PHEOC) was set up in late January 2020 to ensure statewide coordination of the public health response. The initial remit of the PHEOC was to coordinate case finding, contact tracing, outbreak control, communications, and other preventive actions. In July 2020, the PHEOC became known as the Public Health Response Branch (PHRB) and later became the COVID Influenza Branch in 2022.
- The State Health Emergency Operations Centre (SHEOC) was set up in March 2020 to oversee the NSW Health system operational response to the COVID-19 pandemic. Its role was to manage and oversee clinical operations in hospitals and health facilities, support workforce, support vaccination and facilitate procurement during the pandemic.

These governance structures were designed to provide a coordinated COVID-19 response across all aspects of the health system. They were linked to the State Emergency Operations Centre, which brought together 20 critical NSW Government agencies to coordinate the whole-of-government response to COVID-19.

Purpose and scope

The purpose of the NSW COVID-19 Public Health Response Debrief (the debrief) was to examine the public health response since January 2020 to identify best practices and areas that require strengthening, and to provide implementable recommendations for a stronger and more integrated public health network now and into the future. The NSW whole-of-health COVID-19 debrief that has run concurrently addresses broader health system learnings while this debrief aims to provide a deep dive into key aspects of the public health response.

This debrief focused on public health network activities that supported the NSW Health COVID-19 response, including the activities of the COVID Influenza Branch (formerly PHRB) and public health units (PHUs) in local health districts (LHDs). Activities under review included contact tracing and case and contact interviews; public health surveillance and reporting; venue risk assessment; and communication to the public, and collaboration and communication with the broader health system, government and other agency partners in relation to the public health response. The debrief also examined the impact of COVID-19 on population health service delivery.

Though the scope of this debrief is comprehensive, it occurred in the context of other state and federal government review processes that examined different aspects of COVID-19 responses. To illustrate, Sydney Airport COVID-19 operations, hotel quarantine arrangements and interstate border measures are touched upon in the NSW whole-of-health debrief. Quarantine arrangements nationally have been examined in the *National Review of Quarantine* by Jane Halton.

The implementation and monitoring of the NSW COVID-19 vaccination program is addressed by the NSW whole-of-health debrief and the NSW Audit Office's review of the vaccine rollout. The vaccine rollout review did not address surveillance for vaccine-related adverse events, the support provided to the Therapeutic Goods Administration, or the rapid enabling of research to examine vaccine effectiveness in the Australian context, all of which are covered in this report.

The broader response to aged and disability care outbreaks and intersection with the Commonwealth is touched upon from a public health perspective, however the NSW whole-of-health debrief addresses this in more detail.

Cruise ships are an important setting given the high risk of transmission. Learnings in relation to cruise ships were addressed through the special commission of inquiry relating to the Ruby Princess. Subsequent whole-of-government and cross-jurisdictional work led to the establishment of the Eastern Seaboard protocol to support the recommencement of cruising.

2 Methods

The debrief process included multiple components designed to gather detailed information and a wide range of perspectives and experiences regarding the NSW public health response. These components include an after-action review involving over 100 people across the public health network and an examination of the impact of COVID-19 on population health service delivery across four policy areas (health protection, preventive health, oral health, and alcohol and other drugs). The debrief report was informed by key informant interviews (n=42), exploratory surveys (n=14), workshops with response teams (n=3), sense check consultations (n=25), case studies of best practice (n=36) and desktop reviews of research, reports and documents related to the COVID-19 response. More than 250 personnel were engaged through this debrief across stakeholder consultations and contributions of all kinds.

An Advisory Group with broad representation across NSW Health provided oversight, advice and strategic support for the debrief process. Membership included LHD Chief Executives, Directors of Public and Population Health, Ministry of Health senior executives and public health specialists.

There was also close liaison with the lead and team concurrently managing the whole-of-health COVID-19 debrief. That debrief and related report provides the broader context within which the public health response operated. Many common findings emerged across both debriefs.

3 Key learnings, achievements and recommendations

Cross-cutting themes

Cross-cutting themes emerged that were perceived to have a broad influence on the effectiveness of this public health response and how we respond to future pandemics and other public health threats. The cross-cutting themes below are inter-connected, have application across chapters in the report, and are not exhaustive of all cross-cutting issues.

The response was characterised by collegiality, cooperation and a common sense of purpose

Enabling traditional silos to be broken down brought efficiency gains in business practices

Strong relationships forged across the pandemic between NSW Health, other government agencies, non-government organisations (NGOs) and community groups warrant sustained engagement

The ability to scale innovations across multiple functional areas was a major achievement of the public health response

Flexibility in the response was critical to effective public health action

The collaborative approach to surge across LHDs was a key success of the response

Rural and remote areas experienced distinct challenges centred around workforce capacity and service access and require particular attention in future pandemic plans

Effective planning and horizon scanning was important throughout the response

COVID-19 shone a light on pre-existing inequity

Communicating to the community for behaviour change and use of behavioural science methods is important to effective public health response

Some marginalised populations were particularly challenging to reach and this needs to be addressed in future pandemic plans with the learning incorporated into business as usual (BAU) activities

The transition from reactive to planned work programming is a challenge in a continuum of change

Effectively managing staff welfare is vital in pandemic responses

Staff reflected on ethical issues inherent in public health practice as part of the pandemic response

Capturing key learnings and maintaining corporate history is a major challenge in the transition towards an endemic state of COVID-19

The pandemic response surfaced a range of important training needs for those participating in this and future responses

Summary of key learnings and recommendations by chapter

3.1 Test-Trace-Isolate-Quarantine strategy for managing COVID-19 outbreaks in NSW

The Test-Trace-Isolate-Quarantine (TTIQ) strategy is used to break chains of transmission during a disease outbreak and involves isolating confirmed cases with the disease and identifying and quarantining their close contacts from the community. TTIQ is frequently activated after an individual presents with disease symptoms, at which point they will be tested for the pathogen. This TTIQ strategy, along with hygiene and physical distancing measures, make up the non-pharmaceutical interventions that are often used to suppress infectious diseases. NSW Health developed a world-leading TTIQ capability over the course of the pandemic. This capability evolved over time based on case numbers, vaccination uptake, and changing government policy settings.

Key learnings

The approach to testing evolved over the pandemic as testing capacity was scaled and new technologies, such as rapid antigen tests and rapid turnaround testing platforms, were introduced. The testing strategy must continue to respond to the changing context, noting easy and equitable access to testing is a cornerstone of an effective public health response.

The approach to case and contact interviews similarly evolved with the different challenges and contexts of the COVID-19 waves. Responding to frequent changes in policy settings required significant effort and flexibility. Changes, such as streamlining case and contact interviews, were essential to maintaining the efficiency and effectiveness of TTIQ in a high caseload environment. The ability to share case and contact workload across the public health network was a major strength of the NSW approach. Providing timely access to fit-for-purpose information technology systems was a critical enabler of case and contact management.

Contact tracing teams had to reach and engage with people with complex health or social needs and provide support and advice. This was challenging but critical to effective case and contact management.

Integration of processes for linking cases to virtual care and referral to hospital or healthcare interventions, such as monoclonal antibody therapy and antiviral therapy, were also important to achieving health outcomes.

Public health teams were also required to support critical industries – such as food producers and manufacturers – to maintain their operations through the provision of expert advice on risk mitigation.

Contact tracing teams needed to surge rapidly at various points in the pandemic. Planning for these surges, including workforce training and recruitment and the role of external providers, is critical.

Recommendations

Now	
3.1.1	Maintain and regularly review plans for standing up and surging case and contact teams within the NSW public health network and Health Protection NSW (HPNSW) for use in future public health emergencies. This should delineate early phase essential priorities, next steps, and recommended structures and relevant functions, and include a central repository of case and contact management onboarding and training resources, and standardised tools developed during this response for adaptation to future conditions.
3.1.2	Utilise collaborative platforms in the post-COVID environment in line with proven use cases aligned with data governance and cyber security.
3.1.3	Sustain strong relationships between public health and pathology providers in BAU and strengthen these relationships during a public health response to enable ongoing adaptation of the COVID-19 testing strategy, or relevant future testing strategies.

Near future

3.1.4 Enhance staff training and development both centrally and locally across LHDs for public health emergency responses with a focus on building high-level capability in operational management, strategic planning, policy making and epidemiology.

3.1.5 Expand management and leadership training opportunities available to public health response staff to enhance succession planning and career opportunities.

3.2 Epidemiology, surveillance and reporting

A cornerstone of prevention and control measures during a pandemic is epidemiological surveillance and reporting. Surveillance is the ongoing systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event, to inform public health action. COVID-19 surveillance involves monitoring the spread of the disease to identify patterns of transmission – and for application of preventive and control measures – but can also extend to using data to better understand health system and community impacts.

Key learnings

NSW produced high-quality epidemiological analyses throughout the pandemic. This was possible because of a long-term and significant investment in information systems and epidemiological and statistical capability, and strong collaboration between the Centre for Epidemiology and Evidence and the PHRB.

The existing Notifiable Conditions Information Management System (NCIMS) was used to full capacity with the support of eHealth NSW. Investment in a new system, SIGNAL, has been secured and collaboration between eHealth NSW and Health Protection NSW (HPNSW) to finalise the scope and commence procurement is well advanced. This will allow the learnings from the pandemic response to be embedded in the functionality of the new system.

Maintaining an agreed single source of truth for case reporting and data quality is critical. Changing surveillance definitions over time had implications for mapping information and process flows and presented an additional challenge.

At this stage in the pandemic response, with a return to BAU governance arrangements, it is time to reflect on the ongoing relevance and utility of data fields in NCIMS.

Stakeholders had many different reporting needs, and this presented challenges as prioritisation had to occur. It is important to understand the information and data needs of stakeholders and tailor reports accordingly within a prioritisation framework.

Recruitment of additional staff with epidemiological, data analytic and visualisation skills was challenging, but bringing together people with a diverse range of skills was essential and led to ongoing innovation. In recognition of the importance of having a critical mass of skills to support epidemiological analysis and data insights, a strengthened team within HPNSW is being established. The workforce section provides additional insights in relation to workforce recruitment, training and development, and identifies epidemiology and surveillance as a key area for capability development.

Recommendations

Now	
3.2.1	Significantly enhance data management, epidemiological and biostatistical capability in HPNSW and include a mechanism to flex this capacity using contingent workforce and academic partners in response to future pandemic surges.
3.2.2	Establish closer links between the epidemiological and surveillance team in HPNSW and other Ministry of Health data and analytics teams, including linking with the NSW Health Data Analytics Advisory Committee.
3.2.3	Implement targeted strategies to attract and retain data management, epidemiological and surveillance staff in HPNSW and LHDs, including offering greater tenure, professional development opportunities, involvement in communities of practice such as the Epidemiology Special Interest Group (EpiSig), and research.
3.2.4	Align processes for release and management of COVID-19 data with BAU data governance processes.
3.2.5	Review COVID-19 data fields collected through NCIMS to determine their ongoing relevance to pandemic response surveillance and reporting.
3.2.6	Maintain mathematical modelling capability for COVID-19 and other relevant infectious diseases as an important horizon scanning and pandemic planning tool.
3.2.7	Transition administration of NCIMS to eHealth NSW to reduce key person risk associated with the system's administration and to access additional capacity and capability available across the cluster.
Near future	
3.2.8	Invest in enduring analytical infrastructure to ensure sustainable arrangements that meet the needs of HPNSW under non-pandemic conditions and to proactively respond to future outbreaks and pandemics.
3.2.9	Enhance the Centre for Health Record Linkage's computing, algorithm matching and clerical review capacity to support timely and high-quality record linkage services for COVID-19 research and surveillance projects.
3.2.10	Maintain the capability of the NCIMS platform and invest in the transition to the enhanced infectious diseases surveillance platform (SIGNAL).

4 Priority settings and populations

Due to increased risk of transmission of COVID-19, increased risk of severe outcomes following infection, or risk of critical service disruption, a number of settings and populations were recognised as key priorities requiring a more targeted and nuanced public health response. These included Aboriginal people, culturally and linguistically diverse (CALD) communities, education settings, residential aged care and disability care settings, and correctional settings.

4.1 Aboriginal people

Aboriginal and Torres Strait Islander people make up 4.2% of the total NSW population and 34.5% of the Aboriginal population of Australia. While NSW has a significant metropolitan Aboriginal population, a greater proportion of Aboriginal people reside in rural and remote communities. Aboriginal and Torres Strait Islander people are at higher risk of severe disease outcomes because of high levels of chronic disease. Targeted strategies to protect and support Aboriginal communities are a vital component of an effective public health response. These should be informed and led by Aboriginal people and communities.

Key learnings

It is important that Aboriginal people are represented in pandemic governance structures at all levels to ensure a culturally appropriate and effective response. The establishment of strong partnerships and consultation with the Aboriginal community controlled sector and the Aboriginal Health and Medical Research Council was essential. Local public health units also engaged with local Aboriginal Community Controlled Health Services and local communities to further tailor the local public health response.

Public health messaging was developed and delivered by Aboriginal people and was further localised when needed to address the local context.

Aboriginal people who had COVID-19 and their families benefited from cultural support services and this should be incorporated into BAU and future pandemic plans.

To ensure evidence is used to inform public health decision making, the collection of accurate information on Aboriginality should be strengthened across data collections.

Staff redeployments into the health service and public health responses, while necessary, drew resources away from other important Aboriginal services. Strategies to support the maintenance of high-priority programs during pandemics is essential.

Provision of culturally safe services and care mean that all staff (including broader health sector staff such as GP practice managers and receptionists, and pharmacists and pharmacy staff) should receive appropriate education and training in Aboriginal health and culturally safe practices.

Recommendations

Now	
4.1.1	Enhance training of the public health response workforce in Aboriginal health and culturally appropriate policy and program development.
4.1.2	Explore processes to improve demographic data collection, including Aboriginality, in case management systems and other relevant data collections.
4.1.3	Investigate the utility of the Australian Immunisation Register linked to the Multi-Agency Data Integration Project (AIR-MADIP) as a tool to provide timely data on immunisation uptake by Aboriginality.
Near future	
4.1.4	Continue consultation with Aboriginal communities to ensure communications are focused on priority messaging, are salient, and engage appropriate community champions who are recognised and accepted within the community.
4.1.5	Work in partnership with the Commonwealth, medical colleges and professional organisations to implement strategies to improve the cultural competence of staff working in primary care settings.
4.1.6	Ensure pandemic preparedness exercises include consideration of action in different settings (metro and rural) and with diverse populations, including Aboriginal and CALD populations.
4.1.7	Build on investment in the Aboriginal workforce made during the COVID-19 pandemic, and further strengthen Aboriginal public health workforce participation such that Aboriginal public health personnel are engaged to co-design relevant aspects of the public health response across the health system and are broadly embedded across organisational structures.

Future pandemics

4.1.8 NSW Health to lead a community of practice across NSW Government, Health and the community-controlled sector to engage Aboriginal people, develop communication materials, and share accurate and culturally appropriate information in a timely fashion.

4.1.9 Ensure Aboriginal people continue to be represented within pandemic governance structures both centrally and locally, so the needs of Aboriginal people are included in decision-making processes and policy development.

4.1.10 Consider how emergency management structures could further facilitate input from Aboriginal people in a pandemic response.

4.2 Culturally and linguistically diverse communities

NSW has a diverse and multicultural population with almost one-third of residents born overseas and a high proportion speaking a language other than English at home. Many CALD people experience higher levels of socioeconomic disadvantage, language barriers, low health literacy, and worse health outcomes. Given these challenges and cultural diversity across NSW, thorough engagement and communication with CALD communities was critical to effective public health action.

Key learnings

The NSW public health response built on existing health networks and relationships to engage with local CALD communities. Community leaders along with key partners such as Multicultural NSW and others were critical in working with the public health response to convey public health messages and develop tailored communication materials for local communities.

Communication needs vary between CALD communities and a 'one size fits all' approach should be avoided. For this among other reasons, communication materials should be developed with the input of cultural experts from CALD communities.

It was important to counteract misinformation and ensure communities had access to information from reputable sources. Respected community leaders were credible messengers in counteracting misinformation.

Specific strategies were undertaken to address low health literacy levels. Bespoke resources, such as audio files embedded in text messaging, were developed to meet community needs and assist in adoption of desired behaviours after receiving health information.

Online environments such as community forums provided opportunities – often at short notice – for engagement with local communities to hear concerns and relay public health information.

Using real-time data available through epidemiological and surveillance systems about CALD communities helped inform the public health response. However, more comprehensive data on cultural background and language spoken at home would have enhanced understanding of the effectiveness of strategies.

Some LHDs with considerable cultural diversity needed to manage large volumes of complex cases and contacts, necessitating development of targeted models of public health intervention and communications to support priority populations. These came with high workloads and impacts on staff.

Recommendations

Now	
4.2.1	Draw on research and approaches used to develop communication strategies for CALD communities during the COVID-19 pandemic to address other existing and emerging health problems.
4.2.2	Explore processes to improve demographic data collection, including country of birth and language spoken at home, in case management systems.
4.2.3	Investigate the utility of the Australian Immunisation Register linked to the Multi-Agency Data Integration Project (AIR-MADIP) as a tool to provide timely data on immunisation uptake by socioeconomic and CALD status.
Near future	
4.2.4	Maintain and strengthen relationships developed with CALD communities and partner agencies during the COVID-19 pandemic so these relationships can be drawn upon during current and future public health responses.
4.2.5	Invest in training and development of a multilingual public health workforce.
4.2.6	Invest in further strategies to improve health literacy among CALD communities, including health literacy training for CALD health and community workers.
Future pandemics	
4.2.7	Build on the successful engagement with Multicultural NSW and the Multicultural Health Communication Service in future pandemics and seek their support in effective targeting, message development and engagement with CALD communities.
4.2.8	Engage with key CALD communities to understand information needs, barriers to accessing healthcare, changing communication preferences, and how to promote resilience during public health crises.
4.2.9	Ensure that CALD communities have accurate and timely access to public health information concurrently with the whole population.
4.2.10	Provide training for staff working in future responses so they understand the local context impacting CALD communities and provide tailored and culturally appropriate information and referral to necessary services.
4.2.11	Anticipate additional public health response workload and different workforce skill mix requirements in districts with large CALD populations (e.g. bilingual workers, social workers).

4.3 Education settings

School and early childhood services play a critical role in childhood and adolescent learning, and social and emotional growth. Ensuring ongoing engagement of children in learning was a key focus of work between NSW Health and the NSW Department of Education, given the risks of critical service disruption. Strategies were put in place to minimise transmission in schools and support learning. Throughout the pandemic, there was a focus on communicating the impact of COVID-19 on children. Paediatric research and surveillance were established to generate high-quality local evidence to complement international evidence.

Key learnings

Striking the right balance between student and staff safety and the least restrictive face-to-face learning approaches in educational settings is vital given the importance of such learning to childhood development. Strong engagement and regular communications across government and non-government sectors was a critical enabler in achieving this balance.

Another key enabler of effective policy making and swift operationalisation in a rapidly changing policy context was the existing stakeholder relationship between government departments. Sustained liaison between public health and educational sector leads across government and non-government sectors was crucial to the response. The NSW Department of Education supported liaison with Parents and Citizens groups and Principals Forums. This proved useful and should be embedded in policy approaches and future pandemic responses.

Strong internal linkages between the policy and operational arms of the public health response ensured joined up engagement in and advice to educational settings.

Recommendations

Now	
4.3.1	Strengthen and expand the relationship between the Population and Public Health Division and the NSW Department of Education to enable ongoing collaboration between sectors for pandemic response and to link with broader public health issues.
Future pandemics	
4.3.2	Initiate a process to define policy and operational roles and responsibilities between the NSW Department of Education, LHDs and central public health response teams.
4.3.3	Invest in partnerships with research groups to enable rapid engagement and implementation of research in schools and early childhood settings to understand drivers of transmission and disease severity to inform policy, risk assessment and public communications.
4.3.4	Retain education settings as a priority setting in future pandemics and continue to develop and adapt risk guidelines and public communications over the course of future responses in line with evidence.

4.4 Residential aged care and disability care settings

Increased risk of severe outcomes due to older age, presence of comorbidities and compromised immunity, and shared communal environments are just some of the challenges faced across residential aged and disability care settings.

While aged care is predominantly in the domain of the Commonwealth Government, NSW Health, including the public health network, worked together with the Commonwealth to ensure necessary support and care to residents in these high-risk settings, particularly in the context of outbreaks.

Key learnings

Multiple policy stakeholders came together in the rapidly changing context to develop clear and authoritative advice for COVID-19 policy and procedures. Relationships forged between public health teams, relevant clinical communities in aged and disability care settings, and NGOs were critical to effective public health action and should be sustained.

NSW Ministry of Health policy teams and local public health and clinical teams established effective ways to collaborate. Public health advice was then able to combine with understanding of the unique needs of people with disability in congregate settings – and of harder to reach individuals in supported independent living arrangements – to inform service provision and outbreak management.

The public health approach in aged and disability care settings adapted over time. Striking the right balance between risk reduction through restrictions and resident quality of life and autonomy is a key consideration in a nuanced public health approach in aged and disability care settings.

Substantial gaps in availability of resident demographic, risk factor and service data made risk assessment and outbreak management more challenging. Data sharing regarding public health risk and congregate settings for older people and those with disability should be enhanced in collaboration with the Commonwealth.

The disability care sector provides services to diverse groups of individuals in a wide range of settings. This means that more tailored risk assessments are required to balance the risks and benefits of public health restrictions in each specific setting. In addition, there is greater heterogeneity in disability residential arrangements, with generally smaller numbers of residents in these accommodation arrangements.

Providing tailored public health information accessible for people with a variety of disabilities warrants additional focus during a pandemic response and needs to be incorporated into BAU responses.

Recommendations

Now

4.4.1 Continue to invest in ongoing relationships between public health, clinical groups, other government agencies, and NGOs in aged and disability care settings to support effective clinical care, vaccination and outbreak management.

4.4.2 Investigate mechanisms in collaboration with the Commonwealth for enhanced data sharing between residential aged care and disability sectors and NSW Health to support the public health and health system response.

Future pandemics

4.4.3 Include consumer perspectives in emergency response policy for residential aged and disability care settings to ensure a nuanced balance of safety, risk and personal choice in the context of a communal setting.

4.4.4 Ensure residential aged care and disability continue to be priority settings with effective engagement between the Commonwealth, public health, health system and NGO service providers.

4.4.5 Recognise and plan for the heterogeneity of risk in disability settings in future responses. This requires tailored risk assessment and differs from the assessment and public health action in aged care settings.

4.5 Correctional settings

Correctional settings such as prisons, youth detention centres and forensic psychiatric facilities are high-risk environments for COVID-19 transmission among prisoners and staff, given the many challenges they pose for the prevention and control of infectious diseases. These settings also entailed high need for service continuity. A networked approach centred efforts around prevention, early detection, containment and outbreak management in both publicly and privately run correctional facilities in NSW. Public health advice and support also extended to managing COVID-19 contacts in the court system and advice on how to release prisoners safely back into the community. The prevention and control of COVID-19 in correctional settings was therefore an important component of the NSW public health response.

Key learnings

Correctional facilities were a complex environment during the response, given their congregate living arrangements, inherent restrictions on movement, and the chronic disease profile of prisoners. This required a high level of agility in policy and public health response. Personnel developed significant innovation in practices, such as reception of new prisoners, creating new inter-agency response structures and communication, and developing risk assessment matrices tailored to correctional settings.

Sustained relationships and effective communication between public health, the Justice Health and Forensic Mental Health Network, and Correctional Services NSW are critical to timely and constructive liaison on policy development, risk assessment and outbreak response in correctional settings.

Finding the right balance between the welfare needs of prisoners and staff was complex. Broader welfare concerns for prisoners emerged over time, as numerous outbreaks in correctional facilities and repeated quarantine periods led to some prisoners missing usual health programs. This may be technology-enabled both during a response and as part of BAU enhancements. The pandemic also had substantial impacts on the workforce (e.g. furloughing staff came with greater pressures on those remaining). Acceptable models of isolation/quarantine are a challenge that warrant ongoing consideration for COVID-19 and future pandemics.

There is now a greater focus on and investment in public health in correctional settings. Continued linkages between these settings and LHDs and PHUs will help integrate public health and ensure continuity of health interventions.

Recommendations

Now	
4.5.1	Support finding the right balance between risk from COVID-19 and prisoner welfare and wellbeing, given that correctional settings continue to be a priority for a pandemic response and that isolation/quarantine approaches will need to be adapted in response to cases and variant characteristics.
4.5.2	Ensure systematic documentation of key learnings from the scale-up of COVID-19 public health operations in correctional settings by the Justice Health and Forensic Mental Health Network in collaboration with key stakeholders.
4.5.3	Maintain prevention and control of COVID-19 in correctional settings as a critical component of effective public health response, given that prisons are high-risk environments for COVID-19 transmission.
Future pandemics	
4.5.4	Consider the broad suite of policies and processes for the prevention and control of respiratory diseases in future pandemic responses in correctional settings, including clinical isolation/quarantine, assessment of ventilation, surveillance testing, vaccination, infection control training, personal protective equipment for staff and prisoners, cleaning and disinfection processes, and case reporting systems to monitor respiratory pathogens.

5 Enablers

The public health response was underpinned by key enablers critical to the response: governance, workforce, integration with clinical partnerships, media and communications, information systems, and research.

5.1 Governance: structures and processes to oversee and enable the NSW public health response

Governance broadly refers to the 'structures and processes' in place to oversee and enable the pandemic response. Informed by emergency management plans, a nexus of expert and connected decision-making groups, lines of communication and reporting were activated during the response for coordinated activity. These included at state government level (through emergency management structures and their central and local implementation structures) and across LHDs. Governance arrangements played a critical role in how the NSW public health response was activated and managed.

Key learnings

The scale of the pandemic called for rapid adaptations to the public health response operating model – including people, processes, technology and structures – given the complexity and speed of change.

The emergency management structures provided a governance and operational framework for the initial phases of the public health response, but limitations appeared in the Incident Control System model for governing a response of this scale, complexity and duration.

Managing the high volume of information flows across NSW Health (SHEOC, PHRB, LHDs) and the NSW Government, as well as laterally with other state and national agencies, was challenging. Embedding systems across NSW Health governance structures for strategic issue identification, prioritisation and escalation, as well as comprehensive briefings at various stakeholder levels is important.

Strategic planning both within the response and for likely future scenarios is a critical capability that must run in tandem with a sustained 'now' focus on current problems. Embedding an enhanced strategic planning capability within future public health responses is merited, given the benefits identified in bringing together predictive case modelling, surge resource planning, future scenario planning, and risk assessment and mitigation.

Medical advisers within the PHRB or Ministry effectively led strategic initiatives, noting that clear roles, functions and reporting lines are critical.

Targeted recruitment of experienced operational managers, including those skilled in managing very large teams, is an enhancement warranting attention in future public health responses. Establishing clear line management and reporting for response managers is required.

Communicating strategic priorities or significant operational resets throughout the response was important for maintaining a common sense of purpose and operational planning.

Boosting capability at senior leadership levels is important. Having a flexible approach to drawing in and rotating suitably qualified senior staff to deputise in critical areas of the response will enhance strategic capability and reduce fatigue and key person risk during future pandemics. This capability should be built during BAU and is further discussed in the workforce section.

The Health Protection Leadership Team (HPLT) was a critical forum for strategy, information exchange, operational planning and implementation but it sometimes had to grapple with balancing local priorities and forging consistency in practice across the state. Standardisation of processes and tools and dissemination of these to the public health network is a critical enabler of effective public health response.

Clear, consistent and regular engagement by public health teams with LHD Chief Executives (CEs) was considered vital to giving CEs a better 'line of sight' and supporting their decision making and effective action in the complex ecosystem of the response.

After-action reviews provide a means to observe how well preparedness systems perform in real-world conditions after a response and can help identify and improve public health emergency preparedness and response. Intra/after-action review processes were identified as an important quality improvement and reflective tool and should be expanded as part of routine public health practice.

Recommendations

Now	
5.1.1	Review and update the NSW Public Health Incident Control System, minimum standards for public health preparedness and associated training to incorporate key learnings from the COVID-19 pandemic.
5.1.2	Review the organisational structure of HPNSW to effectively integrate emergency response functions into BAU and include consideration of reporting lines, operational metrics, surge capacity and governance, with the flexibility to respond to future public health emergencies.

5.1.3	Undertake ongoing development of Health Protection performance and standards that takes account of organisational requirements, leverages existing formal and informal metrics for identifying risk and optimising system performance, and complements concurrent efforts aimed at enhancing corporate governance and relationships with key partners, such as LHDs. This process should inform operations under both BAU and emergency conditions.
5.1.4	Build enhanced Executive-level strategic planning capability within HPNSW for response planning and coordination, and related organisational change.
5.1.5	Review the terms of reference of HPLT, given key lessons learned from the pandemic, and delineate roles and responsibilities, noting HPLT may serve different functions depending on the nature of issues being considered.
5.1.6	Maintain and build on relationships that have been built during the pandemic both centrally and locally, including with central agencies, clinical networks, primary health networks, the education sector, Multicultural NSW and NGOs.
5.1.7	Embed use of intra/after-action reviews as part of routine public health practice across the network as a mechanism for practice improvement, future pandemic and emergency processes planning, and/or as a vehicle for personnel debriefing on challenging events.
5.1.8	Develop an implementation plan arising from this debrief report in consultation with relevant implementation stakeholders.
Future pandemics	
5.1.9	Consider mechanisms for timely and appropriate briefing of the broader public health network on major changes in the response strategy, including online town hall events throughout the pandemic.
5.1.10	Embed advisers or senior public health managers in SHEOC to assist decision making and translation of public health orders into operational planning and coordination, and to link back to public health.

5.2 Workforce capability and surge capacity

A capable, multidisciplinary public health workforce was essential to mounting an effective public health response. The NSW public health response also relied on personnel drawn from a range of professional backgrounds, including from government, universities, non-government partners, the Australian Defence Force, and the wider community. This brought in broader and essential skills such as policy writing, communications, community engagement, clinical operations, and inter-government relations.

The response called for operation 7 days per week over the course of the pandemic. An initial rapid scale-up of staffing, recruitment and workplace systems to support the public health response was required, with repeat efforts in 'surge' recruitment as the pandemic phases evolved in NSW. Thousands of personnel participated in the NSW public health response.

Key learnings

Significant and repeat surging of the public health workforce over successive waves of COVID-19, both centrally and locally, represented a substantial achievement for NSW Health.

A multidisciplinary and culturally diverse public health workforce was found to be critical to effective engagement across government and community. Existing public health training programs and associated alumni were important contributors to the surge workforce. Long-term relationships with academic partners and NGOs were also effectively leveraged for workforce surge and could be expanded for future pandemics.

The medical adviser workforce was an important enabler of flexible and effective public health response, especially in its intersection with clinical systems.

Centralised recruitment and mass onboarding facilitated the rapid surge in workforce, given staff working in the response were too time-poor to identify and select candidates. Rapid training on roles and responsibilities within different functional areas of the surge workforce was recognised as critical to an effective public health response.

Accurately determining workforce deployment across the response both centrally and locally was challenging, related to some limitations in integration of human resource management systems. The complexity of award structures made deployment and rostering of response staff challenging, both centrally and locally.

Repeated surge staffing, rapid and constant operational change over several years, and anxiety associated with feeling 'we cannot fail' resulted in a depleted and tired workforce. Reducing key person risk and ensuring sustainable working practices across central and local response structures, especially in leadership and highly specialised positions, is critical. All staff, including key position holders both centrally and locally, should have clearly appointed delegates or substitutes and structured downtime. Measures to support staff welfare and maintain sustainable work practices should be implemented early and become usual business practice throughout public health responses.

Integration of human resource and operational functions at Executive level within the organisational structure of the NSW public health response would have strengthened the response and related workforce planning and operations. The response would have benefited from additional operational and system management expertise.

Response contraction with the transition toward an endemic state of COVID-19 and return to BAU has been challenging, given the shift from the 'high' of the response, staff attrition, and the move to more strategic functions in many areas. However, the pandemic also developed a new generation of public health workforce, and talent retention and workforce development should be a priority.

Mathematical modelling for prediction of COVID-19 cases, alongside consideration of factors such as TTIQ capabilities and the prevailing context, are important for workforce planning. Workforce preparedness planning should consider a model for staged scale-up of response operations that identifies standing capacity in public health expertise and where to target ongoing training and development efforts beyond this existing capacity.

A whole-of-health system workforce approach is necessary to effectively respond to a pandemic. Normalising the expectations of health professionals and broader NSW Health staff for participation in future pandemic responses is important, as is participation in surge planning and maintaining capability to rapid upskill staff in emergency management.

Recommendations

Now	
5.2.1	Continue to invest in a robust multidisciplinary and culturally diverse public health workforce both centrally and locally, including population health training programs, as this is critical for long-term sustainability of public health preparedness and response.
5.2.2	Maintain a strong medical adviser workforce in the Population and Public Health Division as an important enabler of effective public health response.
5.2.3	Develop a strategy to identify, retain and develop high value public health talent developed across the public health network during the pandemic.
Near future	
5.2.4	Improve human resources data systems so they can produce accurate and timely reports of staff deployed in the public health and health system responses, including in LHDs.

5.2.5	Develop and/or collate a suite of training resources that cover key functions of the public health response that can be used to train new staff in any subsequent response surge.
5.2.6	Review existing industrial instruments used to employ public health response staff and determine the most efficient employment mechanisms that accommodate shift work for future pandemics, both centrally and within LHDs.
Future pandemics	
5.2.7	Use mass onboarding agreements with key government, non-government and academic partners as an effective public health workforce surge tool in future pandemics.
5.2.8	Make greater use of non-clinical staff with operational management expertise in the central and local public health response.
5.2.9	Formally integrate a dedicated capability that includes human resources, finance, procurement, and strategic planning functions as a relationship manager into the organisational structure of the NSW public health response.
5.2.10	Proactively manage and monitor staff wellbeing using periodic surveys from the start of future pandemics to provide tailored and timely support services and training for frontline public health workers.
5.2.11	Implement public health response structures and support sustainable work practices both centrally and within LHDs, including for highly specialised and leadership positions.
5.2.12	Train and develop capabilities at a senior leadership level under BAU conditions. During a response, boost capability using a flexible approach to draw in and rotate suitably qualified senior staff. This will enhance strategic and other key capabilities, reduce fatigue, and minimise key person risk.
5.2.13	Ensure that future surge planning for case and contact teams includes consideration of skill mix (such as public health expertise, customer service skills, multilingual skills, management and communications), and consider potential sources for accessing personnel, triggers for surging, and methods for scaled escalation.
5.2.14	Maintain separate teams, where possible, early in a response for contact tracing/positive case interviews versus a call centre for public enquiries, to support better customer experience.

5.3 Integrating the public health response with clinical partnerships

A central challenge in responding to COVID-19 was the need to integrate public health actions with timely, high-quality clinical services across all areas of the response. Regular and meaningful engagement with health partners and clinical leaders was vital to informing and guiding the response, ensuring timely identification of issues, and facilitating a flexible and tailored response. Clinical partners, including GPs and pharmacists, were integral to the public health response for testing and treatment, vaccination, advice to patients, and in their roles as community leaders. Clinical engagement was also an important contributor in countering misinformation.

Key learnings

Public health leaders communicating with clinicians and peak bodies from the outset of the pandemic about evolving evidence on COVID-19 and its transmission was critical and continued throughout the pandemic. An example was working with the Royal Australian College of General Practitioners (RACGP) to support regular webinars for GPs that provided accurate and timely COVID-19 information.

Linking clinicians to the latest evidence about adverse events from COVID-19 vaccination facilitated evidence-based practice and effective clinical decision making. The enhanced surveillance system for monitoring adverse events related to vaccination also built clinical and public confidence in vaccine safety.

Drawing on clinical expertise to inform and develop the public health response was fundamental to success and took various forms, for example through expert panels and consultation with clinical networks and LHD clinical groups.

Two-way integration of public health advice and clinical responses at an individual patient and broader system level was also critical, for example through clinical councils and communities of practice. This integration also included engagement with and support for GPs, pharmacies and primary health networks.

Recommendations

Now	
5.3.1	Continue to engage with and communicate information to clinical networks and peak bodies about COVID-19 as new variants emerge and when there are major shifts in strategic approaches and the evidence base.
5.3.2	Maintain strong working relationships with primary care, continue the RACGP webinar program for critical public health issues, and investigate expanding the webinar program to the pharmacy sector.
Future pandemics	
5.3.3	Include enhanced surveillance of adverse events following immunisation in future public health responses, as this was an important tool to build clinician and public confidence in vaccination.
5.3.4	Continually disseminate trusted advice about infectious diseases, public health measures and associated implications for clinical practice to key clinical stakeholder groups as a vital part of the public health response.
5.3.5	Establish scalable systems and processes early to integrate public health and clinical responses to individual cases and, where relevant, for BAU conditions.

5.4 Media and communications

Empowering the public with the right information was critical for the response. Effective communication strategies can build public trust and confidence, and help the community understand the behaviours needed from individuals, communities and organisations to prevent the spread of disease during pandemics.

Effective communication was essential. There was a huge level of public and media interest in COVID-19, generating the need for comprehensive and agile media and communications responses. Media and communications were therefore central pillars and vital enablers of the public health response throughout the pandemic.

Key learnings

As critical elements of effective public health response, media and communications teams were proactively engaged early in the response and strong ongoing relationships with policy teams were formed. This collaboration was vital to ensuring that information and resources met the needs of the community, including those with lower health literacy or English as a second language. The review of key resources and guidelines by media and communications teams should be incorporated into approval processes before public release.

Media conferences were a critical communication vehicle with the public. They reached very wide audiences and enabled direct communication of important updates and the rationale for changes. They also provided the opportunity to appeal to the public with respect to critical health advice. Having a pool of media-trained spokespeople, including those with diversity of cultural backgrounds and language, can assist in the development of proactive media content centrally and locally. This also enables sharing of the workload in media and communications engagements. Real-time translation in multiple languages was also an effective communication strategy.

Effective communication with target audiences requires insights and data from multiple stakeholders, including public health teams, epidemiology and surveillance data teams, clinicians, consumer research and others. Local intelligence in 'on the ground' insights is critical to the development of effective communications strategy, as is co-design with cultural experts and delivery by trusted local leaders embedded within the community who help develop shared language and leverage reach with local communities. Messaging must have evidence built in and be inclusive of impacted communities. Technology innovations also supported messaging to hard-to-reach cohorts.

Integration with whole-of-government communications is also critical and is reliant on strong and trusted relationships across government and being able to leverage all available communication channels.

Media campaigns should reach the whole population, as well as targeted population segments. This requires multi-channel communications strategies and local community engagement. Multi-channel communications can hit different target audiences and leverage reach during a public health response.

A 'one size fits all' communications approach does not work in a multicultural society. Tailored messaging and drawing on multicultural expertise within communities take time but are necessary for appropriate translation of content and effective communication with the whole community.

Communications also needed to be informed by public sentiment as the pandemic evolved and community attitudes and context changed.

Misinformation and disinformation must be countered promptly and consistently, given the wide and rapid reach of social media.

Recommendations

Now	
5.4.1	Continue to include media and communications teams in key COVID Influenza Branch/HPNSW public health policy and operational team meetings to improve situational awareness.
5.4.2	Continue joint planning between media and communications teams and public health teams to understand the policy and operational context and to support the development of proactive media and communications that meet strategic need.
5.4.3	Continue to use available communication and stakeholder engagement channels for promotion of public health messaging and proactively countering misinformation.
5.4.4	Public health response teams should continue to draw on and work closely with media and communications teams to ensure clarity of key resources and policy guidelines prior to public release.
Near future	
5.4.5	Maintain a pool of diverse, multilingual media-trained NSW Health public health staff and physicians who can be public health response spokespeople and can also feature in proactive communication activities both centrally and locally.
Future pandemics	
5.4.6	Expand BAU communications capabilities and, under pandemic conditions, augment with additional CALD and Aboriginal communications capability in a dedicated team.
5.4.7	Ensure communications campaigns are effective by using a combination of mass media, web based, social media and local community engagement, and including tailored strategies to reach CALD and Aboriginal populations.
5.4.8	Ensure communications campaigns are accompanied by community engagement strategies implemented in collaboration with LHDs and community organisations on the ground to achieve better reach to vulnerable communities.

5.5 Information systems and capacity

During the pandemic, information and technology systems played a critical role in managing data and other information to support decision making. This included systems for surveillance and case and contact management to collect and share information across the public health network, to inform policy action, and assist in two-way communication with affected community members. Before COVID-19, NSW Health had well-established information systems for surveillance and management of communicable diseases in NSW. These information and technology systems were continuously adapted. New systems were established to support the changing needs of the public health response in NSW. The pre-existing capacity of NSW Health to build and manage information systems was a strength of the public health response.

Key learnings

The diversity of information systems and processes across LHDs was sometimes a challenge when integrating a statewide system. Despite the challenges, NSW Health was able to leverage existing information systems and rapidly develop new platforms by bringing together the right combination of technical skills and subject matter expertise. This is preferably undertaken across the NSW Health cluster to support at-scale work.

Patient Flow Portal and NCIMS integration early in the pandemic was able to link data on positive cases with hospitalisations and ICU admissions data. This was a new and critical integration of public health surveillance and clinical information systems resulting in improved situational awareness of public health actions and understanding of pandemic impacts on the health system.

Implementing information systems – largely text message-based – that allowed rapid communication with large groups of people was key to supporting the public health response. These allowed response teams to reach out quickly and stay in contact with people impacted by COVID-19, reducing the chance of onward transmission.

Introducing a capability to text 'sound files' enabled contact with COVID-affected individuals with low literacy or who needed information in other languages.

Information systems require training and experience to use them effectively. Achieving this in a timely manner, particularly under surge and high workload conditions, was challenging.

Developing new ways of working between the Ministry of Health and relevant pillar agency partners was critical to rapid development and integration of information systems for common purpose.

Recommendations

Now	
5.5.1	Review information technologies used during the pandemic and determine their utility for ongoing pandemic response and broader outbreak management in conjunction with eHealth NSW and as part of the new NCIMS Platform Continuous Improvement Design Working Group.
5.5.2	Strengthen surveillance and outbreak management platforms in NSW and continue investment in the development and implementation of the new SIGNAL system as a replacement for NCIMS.
5.5.3	Maintain and strengthen relationships with key technical and subject matter experts outside the Population and Public Health Division, including eHealth NSW and academic partners, in the refinement and development of new information technology systems.
5.5.4	Provide ongoing training and competency attainment in existing information systems as this is critical to ongoing pandemic and outbreak management across the public health network.

Near future	
5.5.5	Strengthen clear governance structures for development and refinement of health protection data and information systems and ensure strong policy engagement with the program of work.
5.5.6	Review ongoing call centre requirements in light of existing statewide and Commonwealth Government call centre capabilities and identify an approach to surge and manage high volume inbound calls from the community while ensuring technical skills and key personnel to stand up the system.
5.5.7	Pilot Public Health Rapid, Emergency, Disease and Syndromic Surveillance (PHREDSS) sourcing rapid emergency department data from the Patient Flow Portal Operational Data Store to synthesise public health surveillance and clinical service utilisation data.
5.5.8	Continue to monitor the market for innovative approaches and tools to support core functions of HPNSW and take a user-centred design approach (e.g. alternative tools and mechanisms to communicate with people at-scale in a coordinated way).
Future pandemics	
5.5.9	When developing information systems in future public health emergencies, note the importance of implementing co-design processes that consider operational requirements and capacity across the Ministry, pillar agencies and LHDs.

5.6 Research

The NSW Health COVID-19 Research Program was established in 2020 to contribute knowledge to the NSW COVID-19 response and to minimise the health and social impacts of the pandemic in NSW. Agile research infrastructure that facilitates rapid research production and knowledge dissemination is a powerful tool in the response to a public health emergency such as the COVID-19 pandemic.

Key learnings

The translation of COVID-19 research into NSW pandemic response decision making was a success by international standards. Reorientation of existing funding schemes collectively resulted in outstanding examples of research translation.

The NSW Health COVID-19 Research Program largely achieved its key objective of establishing a pathway to create knowledge and innovations that support the pandemic response.

The Emergency Response Priority Research workstream enabled rapid generation of local evidence and its translation into operational and policy decisions, such as in wastewater surveillance, vaccine effectiveness and COVID-19 transmission in schools.

A key strength of the NSW approach was engagement of senior public health and health system representatives in identification of research priorities and the rapid deployment of research funding.

Leveraging existing relationships and investment within the health research sector meant research on policy priorities could be rapidly deployed. This was critical in maintaining research informing decision making during the public health response.

Embedding academic partners in the public health response was an important enabler of both research translation and workforce surge. Engaging clinical advisory groups bringing together public health, research sector and health system stakeholders was another important enabler of research engagement and translation.

Research translation achieved in the pandemic was built on a long-term investment in ‘research ready’ environments in population health in NSW. Research impact assessment is an important tool to determine policy and practice impacts and value for money.

Recommendations

Now	
5.6.1	Continue to use clinical advisory groups as tools to engage policy makers and the research sector in identification of research priorities.
5.6.2	Identify key lessons learned about research translation from the pandemic and incorporate into BAU.
Near future	
5.6.3	Develop a collection of COVID-19 public health research conducted across the public health network during the pandemic, including local research and projects funded through NSW Health funding schemes, and consider key implications of the research for practice.
5.6.4	Conduct an impact assessment and evaluation of the research competitively funded through the $28m COVID-19 response and recovery investment at the completion of the funding period in June 2023.
Future pandemics	
5.6.5	Leverage existing research infrastructure and partnerships and fund direct engagement of leading researchers to rapidly generate policy-relevant evidence and assess proposals through a rapid emergency response assessment panel.
5.6.6	Embed research staff into response epidemiology and surveillance functions to facilitate research translation and improve workforce capacity and surge.

6 How population health services adapted to COVID-19

The COVID-19 pandemic resulted in the disruption of many population-based programs and services. The population health workforce was widely deployed to the response, including in contact tracing and case management, assisting with testing activities, and taking up leadership roles, and was actively engaged in developing solutions to emerging problems on the ground. Impacts of COVID-19 on population health program and service delivery were examined across four policy areas (health protection, preventive health, oral health, and alcohol and other drugs).

Key learnings

Population health staff were a critical surge workforce for the NSW public health response, at times comprising the majority of many surge teams, particularly in the initial pandemic phases.

The population health workforce faced significant changes to their roles and practice throughout the pandemic, including those who continued to shoulder the burden of progressing BAU work. This impacted staff morale and wellbeing over time.

High levels of flexibility and collaboration among program partners ensured ongoing service delivery was possible.

Technology platforms – such as for communication and engagement between colleagues – were widely adopted. Further work is required to understand the potential interoperability and scalability of these technologies. Hybrid forms of online service delivery were also adopted and some adaptations have already undergone evaluation.

COVID-19 had variable impacts on population health service modifications, service disruptions and availability of screening and treatment services. It is important to minimise impacts on users of affected programs and efforts are now underway to address lags related to the impact of COVID-19.

A systematic process to capture local service adaptations and innovations and share these collaboratively across LHDs would be useful to inform future program and service design.

Recommendations

Now	
6.1	Implement a process for sharing adaptations to population program/service delivery made during COVID-19 across the Ministry, LHDs and NGOs to inform future program and service design.
6.2	Population health policy areas should assess which adaptations to service delivery made in response to COVID-19 were effective and should form part of standard program and service delivery.
Future pandemics	
6.3	Develop risk assessment and mitigation approaches to minimise impacts on population health programs and services during large scale pandemic responses.

7 Limitations

Efforts were made to engage with a broad representative group. However, a response of this scale included thousands of participants and their perspectives varied according to their role, location, seniority and length of involvement. Some personnel had left the response and were no longer available to participate in this debrief. Despite these limitations, there was remarkable concordance on the issues raised by stakeholders and the debrief stands as a sound reflection on this significant emergency response.

1 Background and context

On 31 December 2019, the Wuhan Municipal Health Commission, China, reported a cluster of pneumonia cases in Wuhan, Hubei Province. A novel coronavirus was eventually identified.

The first case of novel coronavirus (nCoV-19) in Australia was reported in Victoria on 25 January 2020, with an additional three cases confirmed in NSW later that day. The name for the disease caused by nCoV-19 – coronavirus disease (COVID-19) – was announced by the World Health Organization (WHO) on 11 February 2020. On 11 March 2020, the WHO declared COVID-19 a pandemic.

At the beginning of the COVID-19 pandemic, there were many uncertainties around how citizens of NSW and Australia more broadly would be affected: how many cases and deaths would occur; what the impact on the health system would be; and broader societal impacts, including impacts on mental health.

This report reflects specifically on the public health aspects of the NSW Health COVID-19 response, to capture key achievements and lessons learned and to provide recommendations for improving public health pandemic responses now and into the future. The 104 recommendations in this report reflect the major themes identified through public health debriefing sessions ('after-action reviews'), stakeholder surveys and interviews, and input from an expert Advisory Group.

*** Note on nomenclature**

Public Health Response Leadership Executive – Chief Health Officer (Public Health Controller), Deputy Chief Health Officer, Deputy Public Health Controllers

Public health response – local and statewide responses

Local public health response – public health units, local health districts

NSW public health response – Public Health Emergency Operations Centre/Public Health Response Branch/COVID Influenza Branch (depending on timeframe)

Central agency – Department of Premier and Cabinet, Treasury, Department of Customer Service

1.1 NSW public health response*

The State Emergency Management Plan (EMPLAN) sets out the governance and coordination arrangements and roles and responsibilities of agencies underpinning the NSW COVID-19 response (NSW Government 2018). Under the EMPLAN, NSW's response to a pandemic is led by NSW Health, with the NSW Police Force leading the enforcement of restrictions and overseeing hotel quarantine, and with cross-collaboration with partner agencies (NSW Health 2022). The Health Secretary, as Incident Controller, has overarching responsibility for Health's response and for establishing an incident management team, as set forth in the *NSW Health Influenza Pandemic Plan* (NSW Health 2016). Health Protection NSW (HPNSW), under the leadership of the Chief Health Officer as Public Health Controller, is responsible for coordinating the public health response. The Pandemic Plan builds on previous pandemic experience, informed by lessons from severe acute respiratory syndrome (SARS) in 2002 and H1N1 influenza (swine flu) in 2009.

Two structures were established by the NSW Ministry of Health to direct the health response to the pandemic. Both were set up using an Incident Control System (ICS), an emergency management structure designed to perform the functions of control, planning, operations and logistics (AFESAC 2011).

- The Public Health Emergency Operations Centre (PHEOC) was set up in late January 2020 to ensure statewide coordination of the public health response. The initial remit of the PHEOC was to coordinate case finding, contact tracing, outbreak control, communications, and other preventive actions. In July 2020, the PHEOC became known as the Public Health Response Branch (PHRB).
- The State Health Emergency Operations Centre (SHEOC) was set up in March 2020 to oversee the NSW Health operational response to the COVID-19 pandemic. The initial remit of the SHEOC was to enact, operationalise and implement public health orders, assist local health districts (LHDs) and specialty health networks to build critical care and emergency department capacity, establish COVID-19 testing clinics and coordinate the supply of personal protective equipment (PPE) (NSW Health 2022).

These governance structures were designed to provide a coordinated COVID-19 response across all aspects of the health system. They were linked to the State Emergency Operations Centre, which brought together 20 critical NSW Government agencies to coordinate the whole-of-government response to COVID-19.

The existing public health network was the backbone of the COVID-19 public health response in NSW. This network operates using a decentralised 'hub and spoke' model, with HPNSW functioning as the 'hub' and 12 public health units (PHUs) across 15 LHDs functioning as the 'spokes'. In the NSW public health response, the PHEOC/PHRB (initially incorporating staff from HPNSW, the Centre for Epidemiology and Evidence (CEE) and the Office of the Chief Health Officer) provided centralised coordination and additional surge capacity and support to PHUs when required. PHUs had primary responsibility for managing the public health response within their respective LHDs, including conducting case interviews and identifying potential contacts. They were also responsible for local outbreak investigation, conducting business compliance audits, managing large-scale venues and events, and managing calls to local public health information contact numbers. The governance of the network was provided by the Health Protection Leadership Team (HPLT), including PHU directors and managers from PHRB. The team met daily during peak activity phases with meetings chaired by the Public Health Response Deputy Controller, the Chief Health Officer, or a delegate.

Other Ministry centres (such as human resources and media and communications teams) and pillar agencies (Bureau of Health Information, Agency for Clinical Innovation, Clinical Excellence Commission, eHealth NSW, Cancer Institute) also contributed to the public health response by supporting various workstreams of PHRB and providing staff. In most instances, dedicated COVID-19 response support teams were set up for specific purposes, including operations, planning, policy, contact tracing, epidemiology and surveillance, and media and communications. Additionally, public health workforce surge requirements were supported by other centres within the Population and Public Health Division (e.g. Centre for Aboriginal Health, Centre for Population Health, Centre for Oral Health Strategy, Office for Health and Medical Research, Centre for Alcohol and Other Drugs, and HPNSW), LHD staff from health promotion services and health services under temporary closure, other NSW Government departments, the Australian Defence Force (ADF) and external recruitment.

The NSW public health response was coined by the different waves of the pandemic. Major events led to subsequent changes in the public health response, including mask wearing mandates, stay-at-home orders, capacity restrictions in venues and homes, check-in requirements at venues and events, and testing and quarantine requirements. The measures were enacted as public health orders by the NSW Minister for Health under the Public Health Act 2010. They were designed to reduce the spreads of COVID-19 and were therefore adjusted according to rates of community transmission and, later, rates of vaccine uptake.

The course of the pandemic in NSW, can be broken down into distinct periods:

- **Wuhan strain (January–December 2020)**: beginning with the first diagnosed case of COVID-19 in NSW. In the initial phase of the pandemic in early 2020, a suppression strategy was effectively pursued with the goal of minimising community transmission. Test-Trace-Isolate-Quarantine (TTIQ) capability was expanded. This approach was successful in suppressing local transmission in NSW after COVID-19 outbreaks in March, July and December (two concurrent clusters) 2020, when the original strain of SARS-CoV-2 circulated internationally.
- **Casula outbreak in Sydney (July–November 2020)**: beginning with an incursion of the virus from Victoria and ending with the suppression of local cases.
- **Avalon and Berala outbreaks (two separate incursions) in Sydney (December 2020–January 2021)**: a cluster of cases began emerging in the Northern Beaches Local Government Area (LGA) of Sydney. This was accompanied by a concurrent but separate incursion and cluster in Berala (see Case Study 1 in Appendix E). Subsequent implementation of stay-at-home orders for these areas led to the suppression of local cases.

- **Monitoring variants of concern (February–June 2021)**: locally-acquired case numbers were low during this period, arising through contact with overseas and interstate arrivals and managed without further community transmission. This period also included the start of the COVID-19 vaccination program in February 2021.
- **Delta wave (June–November 2021)**: the emergence of the Delta variant in NSW in mid-June 2021 came with increased demands on TTIQ systems and subsequent introduction of restrictions and stay-at-home orders (initially for the Sydney metropolitan area and later for regional LGAs). The Delta variant was more transmissible than previous variants and resulted in a more severe illness compared to the ancestral strain, but the vaccines remained effective. The combination of TTIQ, community restrictions and increasing vaccination rates suppressed the spread of the Delta variant in late 2021. By 18 October 2021, over 80% of the NSW population aged 16 years and older had received two doses of vaccine and by 8 November this had increased to 89.9%. This phase ended with the easing of restrictions when high vaccination rates were achieved.
- **Omicron waves (November 2021–June 2022 and beyond)**: the emergence of the Omicron variant in late 2021 resulted in another significant shift in strategy. The changing landscape precipitated by the rapid spread of the Omicron variant in the community prompted the Australian Health Protection Principal Committee on 22 December 2021 to acknowledge that the overall contribution of TTIQ to limiting transmission had decreased with higher case numbers. This led to a heavier reliance on other levers, including indoor mask wearing and strategic use of rapid antigen testing, to control transmission and impacts, particularly in high-risk settings (AHPPC 2021). Omicron possessed even greater transmissibility due to immune escape, with a booster dose required to enhance protection. This period saw the refocusing of contact tracing activities with the aim of protecting those at highest risk of severe disease.

In the first half of 2022, COVID-19 in the community had entered a significantly different phase, resulting in the contraction and reorientation of PHRB and other supporting functions. In April, the purpose and related functions of PHRB were reviewed and transitioned into the COVID Influenza Branch within HPNSW. This new branch was structured so that public health and operational expertise was retained for the transition towards an endemic state of COVID-19, while supporting strategies to minimise impact of COVID-19 on the community as well as other respiratory viruses. Similarly, PHUs started to increasingly return to pre-pandemic business as usual (BAU) activities while continuing to respond to COVID-19 outbreaks in high-risk settings. During this time, both centrally and locally, teams also managed the impact of rising influenza and respiratory syncytial virus on the community.

References

Australasian Fire and Emergency Service Authorities Council (AFESAC) 2011, *The Australasian Inter-service Incident Management System: a management system for any emergency*, Australasian Fire and Emergency Service Authorities Council, East Melbourne, Victoria.

Australian Health Protection Principal Committee (AHPPC) 2021, *AHPPC statement on the Omicron public health implications and response options*, <www.health.gov.au/news/ahppc-statement-on-the-omicron-public-health-implications-and-response-options>.

NSW Government 2018, *New South Wales State Emergency Management Plan*, NSW Government, Sydney, <www.nsw.gov.au/sites/default/files/2021-04/state-emergency-management-plan-emplan.pdf>.

NSW Health 2016, *NSW Health Influenza Pandemic Plan (PD2016_016)*, NSW Ministry of Health, Sydney, <https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2016_016.pdf>.

NSW Health 2022, *State Health Emergency Operations Centre (SHEOC) Achievements Report 2021*, NSW Ministry of Health, Sydney.

1.2 Purpose of the debrief

This report details the findings of consultation conducted during the NSW COVID-19 Public Health Response Debrief (the debrief). The purpose of the debrief was to examine the public health response since January 2020 to identify best practices and areas that require strengthening, and to provide implementable recommendations for a stronger and more integrated public health network now and into the future.

This debrief of the public health response was conducted in parallel with a broader debrief reflecting on the NSW whole-of-health system response to the pandemic (NSW whole-of-health debrief). The scope of the debrief was set to complement this broader debrief, with a detailed focus on core public health activities and the impact of COVID-19 on population health services specifically.

Core PHU and health protection network activities supported the NSW Health COVID-19 response, including the activities of the COVID Influenza Branch (formerly PHRB) and LHDs. Activities under review included:

- contact tracing and case and contact interviews
- public health surveillance and reporting
- venue risk assessment
- communication to the public, and collaboration and communication with the broader health system, government and other agency partners in relation to public health response activities (COVID-19 case and contact advice, community testing advice, advice in relation to public health restrictions and community isolation/quarantine requirements)
- impact of COVID-19 on population health service delivery.

Though the scope of this debrief is comprehensive, it occurred in the context of other state and federal government review processes that examined different aspects of COVID-19 responses. To illustrate, Sydney Airport COVID-19 operations, hotel quarantine arrangements and interstate border measures are addressed in the NSW whole-of-health debrief. Quarantine arrangements nationally have been examined in the *National Review of Quarantine* by Jane Halton (Department of the Prime Minister and Cabinet 2021).

The implementation and monitoring of the NSW COVID-19 vaccination program is addressed by the NSW whole-of-health debrief and the NSW Audit Office's review of the vaccine rollout. The vaccine rollout review did not address surveillance for vaccine-related adverse events, the support provided to the Therapeutic Goods Administration (TGA) or the rapid enabling of research to examine vaccine effectiveness in the Australian context, all of which are covered in this report.

The broader response to aged and disability care outbreaks and intersection with the Commonwealth is addressed from a public health perspective, however the NSW whole-of-health debrief addresses this in more detail.

Cruise ships are an important setting given the high risk of transmission. Learnings in relation to cruise ships were addressed through the special commission of inquiry relating to the Ruby Princess (State of NSW through the Special Commission of Inquiry into the Ruby Princess 2020). Subsequent whole-of-government and cross-jurisdictional work led to the establishment of the Eastern Seaboard protocol to support the recommencement of cruising.

References

Department of the Prime Minister and Cabinet 2021, *National Review of Quarantine*, 15 November 2021, <https://apo.org.au/node/315124>.

State of NSW through the Special Commission of Inquiry into the Ruby Princess 2020, *Report of the Special Commission of Inquiry into the Ruby Princess*, 14 August 2020, <www.dpc.nsw.gov.au/assets/dpc-nsw-gov-au/publications/The-Special-Commission-of-Inquiry-into-the-Ruby-Princess-Listing-1628/Report-of-the-Special-Commission-of-Inquiry-into-the-Ruby-Princess.pdf>.

2 Methods

The NSW COVID-19 Public Health Response Debrief process included multiple components designed to gather detailed information and a wide range of viewpoints regarding the NSW public health response, including:

- An *After-Action Review* (AAR) – An AAR is a framework established by the WHO to guide a structured debrief of significant projects or events to allow team members and leaders to unpack what happened and why, to re-assess direction, and to review both successes and challenges. The ultimate purpose is to inform practice change and improve the effectiveness of future responses (WHO 2022). In this instance, an AAR was conducted from a public health network-wide perspective, including the interface between PHRB and PHUs. It focused on four functional areas (governance, workforce, surveillance, case and contact management) and involved local stakeholder surveys, local PHU debrief sessions and a statewide AAR workshop attended by PHU and PHRB representatives in August 2022. Responses from local stakeholder surveys and PHU debrief sessions informed topics discussed at the statewide AAR workshop. A report summarising workshop discussions, key outcomes and themed recommendations was produced after the workshop. The AAR was conducted between June and August 2022 and included participation from more than 100 personnel from PHUs and the COVID Influenza Branch during both pre-workshop and workshop activity. Key findings and recommendations from the AAR have been integrated into this debrief report.
- An examination of the impact of COVID-19 on *Population health service delivery* across four key policy areas: health protection, preventive health, oral health, and alcohol and other drugs. Methods consisted of a mix of qualitative data collection activities conducted between June and August 2022. Consultations included input surveys sent to key policy centres, followed by stakeholder interviews that informed a series of case studies highlighting best practice adaptations to the pandemic. The findings cover the key challenges and enablers population health services and programs faced, including the lessons learned and future recommendations aimed at preparing these services for similar events.

Specific data collection to supplement the above debrief inputs included:

- exploratory surveys (n=14)
- key informant interviews (n=42)
- workshops with response teams (n=3)
- case studies of examples of best practice (n=36)
- iterative 'sense check' consultations with key stakeholders as recommendations were developed (n=25)
- desktop reviews of research, reports and documents related to and produced throughout the COVID-19 response.

More than 250 personnel were engaged through this debrief across stakeholder consultations and contributions of all kinds.

A mixed-methods approach was used to gather data, information and perspectives of key stakeholders who participated in the NSW public health response, as well as the views and experience of those who worked closely with public health response teams. A full list of respondents who provided input into the debrief is provided in Appendix B.

The debrief process and associated field work was conducted between May and October 2022.

Limitations

Efforts were made to engage with a broad representative group. However, a response of this scale included thousands of participants and their perspectives varied according to their role, location, seniority and length of involvement.

Some personnel had left the response and were no longer available to participate in this debrief. Despite these limitations, there was remarkable concordance on the issues raised by stakeholders and the debrief stands as a sound reflection on this significant emergency response.

Reference

World Health Organization 2022, *After Action Review*, accessed 20 July 2022, <https://extranet.who.int/sph/after-action-review>.

3 Key findings by functional areas

3.1

Test-Trace-Isolate-Quarantine strategy for managing COVID-19 outbreaks in NSW

The Test-Trace-Isolate-Quarantine (TTIQ) strategy is used to break chains of transmission during a disease outbreak and involves isolating confirmed cases with the disease and identifying and quarantining their close contacts from the community. TTIQ is frequently activated after an individual presents with disease symptoms, at which point they will be tested for the pathogen. This TTIQ strategy, along with hygiene and physical distancing measures, make up the non-pharmaceutical interventions that are often used to suppress infectious diseases (Ashcroft et al. 2022).

NSW Health developed a world-leading TTIQ capability over the course of the pandemic. This capability evolved over time based on case numbers, vaccination uptake, and changing government policy settings. Effective case and contact management enabled timely and safe isolation and testing and aimed to ensure any need for clinical referrals, as identified through public health interviews, were met. Most of the 8.5 million residents in NSW were reached at least once during the response by phone, email and/or text message. The Central Contact Tracing Team (CCTT) (i.e. excluding case and contact work by the PHU and PHRB COVID Case Team) spoke to over 1.3 million people by phone call alone. At times, the team was making over 4,000 outbound calls and handling over 2,000 inbound calls per day.

As case numbers across Australia exponentially increased, the effectiveness of TTIQ as a strategy declined (Australian Government 2021). Detailed follow-up of individual cases and identification of all individuals they had been in contact with was no longer feasible in the Omicron phase. The community was encouraged to notify their own contacts who may have been exposed to COVID-19 in home, social or work environments. Efforts shifted to test, trace and isolate in priority, high-risk populations in NSW and to ensuring appropriate referral and clinical support for affected individuals. Nonetheless, there is strong evidence that TTIQ was effective in limiting transmission in the early phases of the pandemic. Under higher prevalence conditions (hundreds of cases per day), TTIQ contributed to a 42% reduction in transmission in Australia and contact tracing systems in Australia were considered highly effective and adaptable in maintaining the national suppression strategies in 2020 and 2021 (Shearer et al. 2022).

The context

Testing and laboratory capabilities were central to the success of the TTIQ strategy

Widespread testing for COVID-19 and prompt result reporting was a key component of the TTIQ strategy. This involved ensuring easy access to respiratory swab collection sites for the community and rapidly establishing drive-through and pop-up clinics to support testing in targeted geographical areas or settings. The success of TTIQ also relied on diagnostic laboratories having sufficient capacity to perform tests and report results within short timeframes to support prompt public health actions to minimise transmission.

Whole genome sequencing of SARS-CoV-2 was critical in supporting the TTIQ strategy. It provided insights into SARS-CoV-2 transmission dynamics, detected gaps in infection control measures (such as with PPE usage and physical distancing), and informed investigations into the source of outbreaks (e.g. breaches in hotel quarantine).

The Public Health Emergency Operations Lab Team was responsible for coordination of activities between the NSW public health response and pathology providers to support the TTIQ strategy. Early in the response, the team worked with diagnostic testing laboratories to improve access to testing, such as with the establishment of pop-up clinics and drive-through collection venues; communicate changes to laboratory requirements, testing options and capacity in diagnostic labs; and streamline the process for notification of test results from non-electronic reporting labs to NSW Health. The team also assisted with the establishment and coordination of COVID-19 testing of returned travellers in hotel quarantine and reporting to inform release from quarantine. SARS-CoV-2 genomics became essential to inform source investigation and for genomic surveillance.

NSW Health Pathology was one of the key stakeholders in the TTIQ strategy, responsible for providing expert advice on testing strategies and diagnostic assays, specialised testing such as virus culture, virus neutralisation and whole genome sequencing, and coordinating the collection and testing for COVID-19 in public COVID-19 clinics and public health facilities. Private pathology providers were also important partners in the TTIQ strategy, providing routine and surge testing capacity to the community (such as when there were localised outbreaks) and assisting with the transport of specimens to the laboratory for whole genome sequencing.

There were many moving parts to the TTIQ strategy, and a main challenge was the rapidly changing dynamics of the COVID-19 response. There were regular changes to the Communicable Diseases Network Australia (CDNA) national guidelines for PHUs, evolution and increasing complexity of available diagnostic assays, and the changing pattern of the pandemic locally, from zero COVID-19, to localised outbreaks, to sustained community transmission.

The arrival of the Omicron variant in Australia led to a surge in the number of COVID-19 cases across Australia from November 2021. This highly transmissible variant, together with a high demand for asymptomatic screening to facilitate interstate travel, meant that PCR testing capacity was outstripped and no longer timely. In November 2021, the Australian TGA approved the use of rapid antigen tests which individuals can use to self-swab at home with results available within 15-20 minutes. From the beginning of 2022, rapid antigen testing and associated self-registration of positive results became a vital supplement to the PCR testing system.

Escalating case and contact management in public health units

NSW Health has long had a decentralised 'hub and spoke' case interview and contact tracing model which uses public health staff from 12 PHUs across 15 LHDs. As the COVID-19 pandemic evolved, case intensity varied across the state, with regional LHDs experiencing outbreaks after metropolitan areas.

At the start of the pandemic (January–June 2020), an ICS with a hierarchical structure of 'command and control' was adopted in PHUs at various stages. Responsibilities of PHUs included case management, contact tracing, incoming calls, and daily follow-up. PHUs also had roles in managing outbreaks in aged care, disability settings and vulnerable shared accommodation settings. Establishing the CCTT in March 2020 was a significant system capacity enhancement at that time.

Information drawn from case interviews and assessment of exposure risk was very detailed when the aim was to stop community transmission. Initially, methods for data capture from interviews were not automated, with close contact and isolation information managed manually using interview forms that were lengthy and not user-friendly. During the July 2020–January 2021 period, metropolitan PHU surge teams expanded. Daily phone follow-up of contacts was replaced with an initial call then text message follow-up, allowing teams to focus on case management, contact tracing and incoming calls. Some PHUs with low case volumes started to assist other PHUs, as well as Victoria, with case management and contact tracing.

The Delta wave (June–November 2021) posed significant challenges across the response. Many PHUs started to experience large clusters of complex cases among vulnerable populations (i.e. drug and alcohol dependent, homeless, people living with mental health issues, social housing) and tried to surge their staffing to meet the increase in cases. Establishment of the PHRB COVID Case Team in July 2021 to conduct interviews helped PHUs manage increasing case numbers by undertaking 'spillover' public health case interviews. In addition, timely contact of cases was facilitated by the introduction of text messaging with an embedded online survey. Surveys were streamlined to focus on the most critical information and telephone follow-up of those who did not respond.

With the initial Omicron waves, the existing approach became unsustainable and inefficient, given the need for all processes to be delivered at very large scale. A further adaptation of the TTIQ system led to individuals self-assessing their exposure, retention of text-based messaging with high-risk cases, and an impetus for cases to communicate with their household contacts, educational facilities and workplaces. In early December, interviews in high-risk settings were prioritised along with strong integration between public health and clinical support teams for continuity of care.

Dispersed public health workforces, fewer options for referral to isolation accommodation compared to metropolitan areas, and fewer translator services were some of the factors that complicated case and contact management for some rural and regional PHUs.

Case Study 2 outlines an example of the complex work undertaken by PHUs in managing outbreaks, inclusive of case and contact management in South Eastern Sydney.

Central Contact Tracing Team

The CCTT (originally known as the Close Contact Tracing Team) was set up on 12 March 2020 in response to an increasing statewide COVID-19 caseload with a corresponding increase in casual and close contacts. Case Study 3 describes the rapid stand-up of CCTT and related learnings.

Given the capacity of PHUs to identify and reach out to all cases and contacts was being exceeded, the CCTT supported PHUs by notifying identified contacts, assessing contact status, and providing quarantine instructions, advice and support. CCTT also triaged calls from the public for welfare support, including food packages and financial support during the Delta wave.

The ADF provided the major surge workforce for CCTT during the early Wuhan phase. Other government agencies, particularly the NSW Department of Primary Industries and Cancer Institute NSW, also joined the efforts. Commercial providers were added to the mix during the Avalon outbreak. As the Delta variant emerged, additional contingent workers were recruited as the standby contingent workers were fully utilised. Additional government personnel also assisted.

Commercial providers became the most readily available surge workforce for CCTT over time. By the end of peak Omicron phase, they were interchangeable with internal teams.

CCTT evolved along with the pandemic, with increasing expansion of staffing (to over 300 staff with capacity to draw on more, including offsite and third-party contractors); increasing sophistication in fit-for-purpose technology; and comprehensive, responsive internal structures and processes. Combined, these enabled high performance in contact tracing, and expertise was able to be outsourced to assist other teams in PHRB, LHDs and interstate.

CASE STUDY 2

COVID-19 outbreak onsite management for apartments of concern and places of shared accommodation in South Eastern Sydney

During the Delta wave of COVID-19 there was evidence of COVID-19 spread in apartment buildings. South Eastern Sydney Local Health District's Public Health Unit routinely monitored addresses of all new COVID-19 notifications to detect cases among people living in apartment buildings or other shared accommodation. Places of shared accommodation have single or dormitory rooms and shared kitchen and bathroom facilities (e.g. boarding houses, student accommodation and backpacker hostels).

Identified cases were interviewed to determine their ability to isolate onsite, and a desktop and environmental risk assessment was undertaken. An outbreak management plan was devised, covering communication, cleaning of shared spaces, access to hand sanitiser and masks, testing of other residents and close contacts, and access to food and other supplies for cases and close contacts ordered to isolate for 14 days. Private pathology collectors were requested to conduct onsite testing on day 1, day 6 and day 12 to reduce potentially infectious people moving through the building and to increase compliance with testing. The results were monitored for any new cases, and the risk assessment reviewed. Private cleaning contractors and caterers were engaged if needed.

The St George Mental Health Service emailed an isolation survival kit to each person affected. Kits detailed available services and a daily schedule of activities to pass the time during isolation. Referral was also offered through standard pathways of mental health support, however resources for this service were stretched and not designed for the volume of isolation support in need.

Management was more complex for places of shared accommodation with limited onsite management. This included backpacker hostels, student accommodation, boarding houses, and small studio apartments where access to sunlight and ventilation is reduced, as is the ability to maintain a clean and tidy area.

The environmental health team provided a key role, gathering information and onsite observations during food deliveries, and supervising private sector 'swab-squads'. Some important reflections are:

- Older apartments such as 1960s–1970s-style 'two story walk-ups', as well as villas and townhouses, were low-risk environments for local transmission of COVID-19 and required little intervention if clear communication was provided.
- Low-cost backpacker hostels lack the resources to support cases or close contacts, and for people to effectively isolate.
- Many students were stranded with a limited network of support and reduced employment opportunities.
- Boarding houses were high-risk settings for infection transmission with poor ventilation and cleaning schedules, limited autonomy, offsite management, and poor record keeping of contact information and basic demographics.
- Early communication with strata managers in preparation for an emergency is important to assist them in better understanding their role.
- There should be capacity for engagement of local emergency operations support at places of onsite isolation (e.g. backpacker hostels) that have limited governance and onsite management.
- Appropriate supplies from Resilience NSW and charity food hampers were critical where those facing an extended period of isolation had limited cooking or reheating facilities.
- Efforts are needed to improve standards and regulation of boarding houses in terms of record keeping, cleanliness and hygiene, and governance.

Case interviews and management in PHRB

The PHRB COVID Case Team (Case Team) was established in July 2021 to respond to the rapid increase in cases associated with the outbreak of the Delta variant. This surge capacity team was formed to support PHUs to conduct positive case interviews where the capacity of PHUs was being exceeded.

Over six months, the Case Team rapidly expanded its workforce surge capacity in line with changing response requirements, priorities and case numbers. Around 750 personnel were onboarded between July and November 2021, drawn from a range of sources, including via 'call outs' to LHDs, pillar agencies and the Ministry, and negotiations with the Australian Public Service and ADF. At peak activity, there were 450 staff engaged across the Ministry site and with the Cancer Institute NSW, Queensland's QTrace team, and contact tracing teams from the Western Australian and South Australian Departments of Health providing case interview capability across NSW and interstate.

As case numbers in NSW declined from October 2021 onwards, the team contracted, with fewer referrals and more calls on staff to return to BAU agencies. When the Omicron variant was beginning to take hold in NSW, access to the previously used surge workforce was no longer possible, as much of this workforce had resumed their usual employment and BAU priorities. The diminishing feasibility of contact tracing in the context of Omicron, concurrent with reduced capacity in the Case Team, led to several strategic changes. The case interview was further truncated and the function was transferred to the CCTT as it provided a significant and available workforce. The two teams were merged in late December 2021.

During the six months the Case Team operated, the design and function of the interview process changed constantly. The team responded to the changing epidemiology of disease, adapted to changing PHU capacity to undertake public health interviews, and developed in-team tools and systems.

Case Allocation Team and coordination of case management across the network

A centralised Case Allocation Team was stood up in PHRB in mid-July 2021 to enable effective allocation and coordination of cases for interview across the network.

This significantly assisted with the increased workload during the Delta wave and resulted in more timely interviews of positive cases by PHRB and PHU case and contact teams. The Case Allocation Team assessed PHU interview capacity daily and the interview 'spillover' would be allocated across the network, often to the Case Team under high-volume conditions. The Case Allocation Team also managed 'escalations' where case and contact teams had identified cases who could not be reached for interview (e.g. those with no contact number, unsuccessful calls, homeless people). They would pursue contact details by searching various sources such as the Electronic Patient Record or the Health Pathology list, or liaise with local police to access their systems for up-to-date contact details where permitted under privacy legislation.

Venue risk management

Venue risk assessment and management was a function shared by PHUs and the Venue Management Team (VMT) in PHRB. The VMT was established in late July 2021 in response to the increasing demand on PHUs to assess potential exposures and associated COVID-19 transmission in workplaces or in association with work activities. It was tasked with responsibility for what became known as the risk assessment of venues. 'Venues' were defined as any premise, business or facility where business is conducted (e.g. supermarkets) or where employees are gathered (e.g. warehouses or restaurants). Venue risk management had two main purposes: to prevent transmission of COVID-19 related to venues (primary objective), and to support businesses to continue to operate as safely as possible (secondary objective).

The VMT collaborated with workplaces to undertake the risk assessment, provide advice, and make the final decision on the risk classification of potentially exposed people. Initial assessments included workers and members of the public. The final phase of the risk assessment process was to send information to the Mass Communications Team in PHRB for public messaging. This messaging was usually to individuals, but sometimes involved information about exposure episodes being added to the NSW Health website.

The VMT also supported external enquiries regarding interpretation of the NSW *Public Health Act 2010* and its implications for managing COVID-19 risk in workplaces.

CASE STUDY 3
Rapid stand-up of the Central Contact Tracing Team in early 2020

The Central Contact Tracing Team (CCTT) was established on 12 March 2020 in response to an increasing COVID-19 caseload with a corresponding increase in casual and close contacts. CCTT supplemented the capacity of public health units to contact trace and provide isolation instructions. The team grew from zero to around 100 staff within several days. CCTT staff were initially drawn from skilled public health teams in the NSW Ministry of Health, such as communicable diseases, environmental health, sexual health, population health, and alcohol and other drugs, along with Biostatistics Trainees. Biostatistics Trainees later formed the initial data team who, among other functions, developed key data capture tools for use by tracers.

Over the coming weeks, large intakes of surge staff – sometimes 30-40 at a time – were brought in, including tranches of personnel from the Australian Defence Force, airlines, and other NSW Government agencies. Interview scripting and development of brief, tailored training materials was required as most of these staff had no, or very little, public health experience, creating an urgency to ensure the delivery of consistent information, advice and support to contacts. Team leads and managers learned it was essential to allow staff, with their diverse skills, to freely contribute to problem solving.

The structure and functions of the team developed organically, borne out of necessity and constant problem solving. A fit-for-purpose structure was established, including a series of small teams or 'pods' with continuity across shifts and a dedicated team leader for each to provide appropriate oversight, escalation and up-to-date information flows. A leadership team was established to manage day-to-day operations and address novel and complex issues. The need for someone dedicated to, and with requisite skills for, bedding down processes, procedures and policy was recognised and actioned.

Offsite working models were trialed as there was concern about potential COVID-19 exposures in the workplace due to escalating case numbers at this time. The number of working contact tracers from each agency was also increased by utilising staff who resided outside the Sydney region. There was also an urgent need to find appropriate accommodation for hundreds of onsite staff working across multiple shifts. Safe distancing needed to be considered but so did the advantages of co-location for problem solving across teams.

The early technology set-up of CCTT was rudimentary with the small team using mobile phones and IT systems that were stretched to their limits. A move to cloud-based sharing platforms, Microsoft Teams and digital telephone systems rapidly and dramatically improved workflow efficiencies and collaboration. Briefings between CCTT and other Public Health Emergency Operations Centre teams two to three times per day became a key means of information sharing. Use of simple and highly visible techniques, such as prominent whiteboards for quick reference on twice daily updates and electronic screens displaying tracking of call numbers, proved useful to inform and incentivise CCTT staff.

Follow-up of contacts was initially done through the NSW Notifiable Conditions Information Management System (NCIMS) using daily surveys distributed via text message. These surveys collected basic data and enabled individuals in isolation/quarantine to flag health and welfare concerns. As the number of contacts increased, the capacity of NCIMS to continue follow-up was exceeded in late March 2020. A new digital solution ('Whispir') for the follow-up of contacts was piloted in May 2020 and embedded into CCTT follow-up processes.

Some early process and technology enhancements included:

- using cloud-based digital platforms enabled contact tracers to work on contact lists simultaneously and brought significant efficiencies in the way work could be allocated, recorded, reported and stored
- working in small teams led by a team leader was central to managing the escalating volume of work at a time of rapid team expansion
- using co-location and onsite participation for better problem solving and incidental learning, acknowledging the challenges of physical distancing requirements for large teams
- using standardised scripting and staff training packages for quick onboarding.

Policy and procedure advice was provided for development of a risk matrix and guidance for businesses. A 'Venue Tracker' database was also developed.

As case numbers rose, highly detailed risk assessments became less viable. The focus moved to prioritising complex assessments, particularly those in high importance venues and critical infrastructure settings (i.e. large supply chains and food manufacturing and distribution companies). VMT and PHU staff were important contributors to public health action in these settings, assisting them to maintain their operations safely.

By late 2021, businesses were able to complete their own risk assessments using the new COVID-19 self-assessment tool and risk matrix developed by the VMT in September 2021. The SafeWork Call Centre was a key partner. It would direct businesses to the tool and matrix, advising them to contact the VMT if they needed assistance in carrying out the risk assessment. The requirement for businesses to notify SafeWork if an employee tested positive to COVID-19 was removed in late January 2022.

In addition to the above efforts aimed at safety in public premises in NSW, from July 2020, COVID-19 safety plans were required of businesses to accompany the gradual reopening of services and reduce risk of transmission. This included for cafes and restaurants, pubs and clubs, sports facilities, cinemas and theatres, and places of worship (Case Study 29 – Appendix E).

Key learnings and achievements

Easy and equitable access to testing is a cornerstone of effective public health response

It was critical that the population understood the importance of testing and were encouraged to seek testing to protect themselves, their family, and the community. This depended on minimising impediments to getting a test; ensuring there was equitable and easy access to testing for all population groups; and ensuring that information provided about COVID-19 was easily understood by all language groups.

Respondents emphasised that early delineation of roles and regular communication between responsible agencies – such as SHEOC, PHRB (including the Labs Liaison team), Health Pathology and private pathology providers – was essential to minimise replication of effort in an environment with many moving parts and challenges, such as COVID-19 testing in quarantine hotels. Barriers to rolling out the testing program needed to be quickly identified and addressed through effective working relationships built on trust, mutual respect, regular communication, and a good understanding of stakeholders' operations.

Partnering with private laboratories and establishing the extensive, free testing network were integral in ensuring easy and equitable access to testing. The introduction of rapid antigen tests and associated self-registration of positive results in early 2022 became a vital supplement to the existing PCR testing system and offered the public choice and greater access to COVID-19 testing.

Public health support to critical industries (e.g. food producers and manufacturing) was vital to maintaining their operations

Public health action in critical infrastructure was vital to maintaining the operations of manufacturing and distribution networks. This was achieved by reducing transmission risk, increasing vaccination rates and controlling outbreaks. From the start of the COVID-19 pandemic, it was clear that workers in food processing and distribution centres were at higher risk of contracting COVID-19 (Dyal et al. 2020), presenting not only health risks but the potential to disrupt food supply chains. In Australia and internationally, COVID-19 has imposed shocks on all segments of food supply chains, simultaneously affecting farm production, food processing, transport and logistics, and demand (OECD 2020). An example of one such effort is outlined in Case Study 4 (see Appendix E). This case study demonstrates that viral respiratory infections such as COVID-19 can cause significant disruption to food processing facilities, and how the redesign of work practices in these facilities during pandemics can reduce these risks.

Streamlining case and contact interviews was essential to maintaining the efficiency and effectiveness of TTIQ

While the level of detail initially captured for case interviews, close contacts and venues in the early phases may have been in line with exhaustive public health interview practice under non-pandemic conditions, this comprehensiveness ultimately became prohibitive as cases escalated. Case and contact interviews were significantly streamlined over time in response to increasing case numbers.

An augmented case and contact management capability within PHRB was a critical support for PHUs. However, respondents identified that many PHUs across the network used different forms and processes, making it more challenging to provide support across LHDs.

Central standardisation of forms and processes earlier in the pandemic would have improved the efficiency of cross-LHD support. Respondents observed that follow-up of affected households was ideally done by one agency to reduce the number of calls and the risk of conflicting information being given, as well as the associated stress put on household members.

Reaching people with complex health or social needs was challenging but critical to effective case and contact management

Cases who were difficult to reach often had not received text notification of their positive status and may have been living in circumstances with higher risk for spread of disease (such as crowded housing) or had risk factors for poorer outcomes (such as multiple comorbidities or Aboriginality).

Cases with complex familial or cultural dynamics necessitated longer case/contact interviews, especially early in the response, sometimes taking hours. LHDs with high numbers of essential workers and cohorts of people with high prevalence of pre-existing health conditions created complexities for case and contact work. This was highly relevant in the 'LGAs of concern' where social and economic disadvantage, mistrust of government, fear of disclosure and its potential impact on jobs or social benefits, and reduced health literacy and access to the health system often coalesced.

Understanding the local context enabled better support for cases and contacts. Recruiting cultural support officers from LHD Population Health was one PHU's strategy in interviewing and building rapport with culturally and linguistically diverse communities. Western Sydney LHD also implemented specific training to help case management teams understand the local context (see Case Study 9 in Chapter 4.2).

Integration of processes for linking cases to virtual care and referral to hospital or healthcare interventions, such as monoclonal antibody therapy and antiviral therapy, were also important to achieving health outcomes.

The ability to share case and contact workload across the public health network was a major strength of the NSW approach

Both co-located and dispersed workforces for case and contact work existed throughout the response and across central and LHD operations.

Central allocation and coordination of cases for interview across the network was a significant innovation.

Having the Ministry site available to physically 'house' the response was clearly advantageous, but some LHDs did not readily have space for operations of teams with 50-100 surge staff. Respondents agreed that the value of proximity to team members and other teams for efficient problem solving cannot be underestimated in fast-paced emergency settings. This is diminished with online, offsite teams, although this mode of work reduced the risk of workplace COVID-19 transmission.

Maintaining morale, currency of skills and engagement was challenging for teams as the response ebbed and flowed. The strategy was for PHUs to keep interviewing locally during low case volume periods, given the advantages of local knowledge. This, however, led to minimal activity for the central Case Team, with subsequent loss of skills and staff attrition over time.

Case and contact teams often had to provide advice and support to people in complex or distressing circumstances

Respondents drew attention to the need to provide emotional support to cases and contacts who were experiencing mental, financial and social difficulties.

Calls were sometimes confronting and distressing, involving scenarios such as family deaths due to COVID-19, mental health crises, and self-isolation requirements in homes experiencing domestic violence. This highlighted the importance of accessing social work and welfare support for cases and contacts. Some respondents noted the strength of using personnel in case and contact teams who had social work backgrounds and who could take priority complex calls and support de-escalation of difficult scenarios. This highlights the importance of the right staff skills mix, effective training in this area for case and contact teams, and integration and escalation to supports within LHD and emergency management structures.

Given the diversity of staff backgrounds in case and contact teams, some felt ill-prepared to handle these scenarios, often needing to draw on their 'life experience'.

The involvement of a psychologist for CCTT during the Delta wave to train staff and team leaders in how to manage people in distress and to establish a debriefing process for every shift was found to be a major process improvement.

The diversity of backgrounds in case and contact teams could also provide benefits, for example in assisting with transmission of information to diverse and less accessible population cohorts. Professionals within teams who were multilingual, who had exemplary communication and organisational skills (such as airline staff), and the Text Relay Service to support calls with people who are deaf or have a hearing impairment, were all drawn on successfully. Teams also accessed a contracted translation service to facilitate calls.

Implementing isolation/quarantine measures was difficult in some rural settings

Some rural respondents identified specific challenges in implementing isolation/quarantine requirements under public health orders in rural settings in some scenarios. Hotels were often widely dispersed, with many owners unwilling to have them used for isolation/quarantine given the early COVID-19 stigma and concerns about downstream impact on their business. Some respondents noted that welfare packs also took time to filter out across rural LHDs.

Responding to frequent changes in policy settings required significant effort and flexibility from case and contact teams

Successfully adapting to high volume and frequent changes to policy settings and related processes was a hallmark of case and contact management across the pandemic. Having strong, resilient, adaptable, supportive and diverse teams was an enabler in a fast-paced and ever-changing environment. Respondents noted that the managers of very large surge teams understood the amount of lead time necessary for downstream implementation of major strategic shifts, given the hundreds of staff in each team, multiple shifts each day, and varying understanding among personnel about public health principles. This lead time did not always accord with expectations of strategic decision makers.

Unclear messaging to the public about frequent changes to public health advice was an ongoing risk. This was particularly the case when CCTT began receiving enquiries from the public via a 1800 number.

Any perceived inconsistency across media releases, social media posts, and the tens of thousands of text messages sent out would lead to high-volume calls with the public seeking clarification in a rapidly changing environment.

Respondents consistently reported that team members responded most positively to process changes when framed within strategic goals. Respondents noted that though public health orders were important risk reduction tools, they did have impacts on people's lives. As such, and being at the coalface of calls, teams sought more communication about the 'why' of decisions. Information flows, particularly around 'strategic resetting' impacting case and contact operations, were critical but could have been improved. A key example of this was the transition during the latter part of the Delta wave from mandated PCR testing, strict isolation, and interviewing every case to asking the public to self-triage in testing and managing illness, though with timely connection to clinical care, and retained interviews with cases who may have exposed vulnerable people or communities.

Such a change in strategy was appropriate and yet many respondents struggled with a sense of failure and the need to 'let go' of previous activity. This highlights the importance of working with teams intensively around such changes to manage their expectations and inform operational planning.

CCTT also took on responsibilities in connecting people in isolation/quarantine to welfare and social support. This significant shift in approach increased the complexity of their work and, arguably, needed earlier strategic planning, especially when implemented at scale.

Having a team of 'deployable experts' from CCTT was highly valuable with cross-pollination in problem solving and learned efficiencies as the Case Team was established and expanded in mid-2021.

Workforce and recruitment strategy was vital to effective surge of case and contact teams

Respondents consistently identified the challenge of evolving team structures while simultaneously onboarding large staff intakes to exponentially expand the workforce (sometimes 50-70 per day in the large central teams), as well as managing the rapidly changing operating environment.

Respondents highlighted the transferrable skills of many staff with prior career experience in aviation, health, emergency services and administration/human resources. CCTT was also able to learn from the ADF about organising, training and managing large volumes of staff.

Surge largely occurred with entry level callers and so the span of control for managers was often quickly exceeded. Team structures needed to include appropriate span of control. Respondents noted that teams were best served when new staff rose through those teams first as 'callers' and were less effective when people were recruited directly into specialist or manager roles.

Training rolling intakes of personnel for surge teams was challenging. Training for surge staff may necessarily need to be 'just in time'. However, adaptive modules for short training sessions for multiple government agency staff offsite were developed for efficient onboarding.

Respondents identified that expanded management training opportunities would make such transitions easier and would bring other benefits, such as improved succession planning. The Health Education and Training Institute developed a targeted training module and workshop on management skills for response personnel that was well received though not sustained as the response ebbed. Respondents praised the abilities of team leaders and leadership support to effect working as one team for the greater good of the NSW community.

The demands of a seven day roster for case and contact teams operating from 8am to 10pm for most of the pandemic was a significant challenge. Many respondents referred to managing fatigue and work/life balance, and some had concerns regarding job security given the necessary short-term, contract-based nature of a significant proportion of recruitments. It was vital throughout the pandemic that the response workforce was able to surge and contract depending on the evolving context; as a result, a temporary contract workforce was an essential part of an agile pandemic response.

Providing timely access to fit-for-purpose information technology systems was a critical enabler of case and contact operations

Respondents identified that use of technology early in the pandemic was rudimentary and quickly reached capacity. Over a short time, a move to cloud-based sharing platforms, Microsoft Teams and digital telephone systems dramatically improved workflow efficiencies and collaboration. These new systems provided the capacity to work simultaneously on contact lists, data storage, and handling and tracking inbound and outbound calls as the response ramped up.

Respondents across both the NSW public health response and the local response also identified challenges in accessing sufficient volumes of laptops – an essential tool for case and contact work – in a time of worldwide shortages.

Chapter 5.5 on *Information systems and capacity* details technology support brought into the response, including that applicable to case and contact work.

Recommendations

Now

3.1.1 Maintain and regularly review plans for standing up and surging case and contact teams within the NSW public health network and HPNSW for use in future public health emergencies. This should delineate early phase essential priorities, next steps, and recommended structures and relevant functions, and include a central repository of case and contact management onboarding and training resources, and standardised tools developed during this response for adaptation to future conditions.

3.1.2 Utilise collaborative platforms in the post-COVID environment in line with proven use cases aligned with data governance and cyber security.

3.1.3 Sustain strong relationships between public health and pathology providers in BAU and strengthen these relationships during a public health response to enable ongoing adaptation of the COVID-19 testing strategy, or relevant future testing strategies.

Near future

3.1.4 Enhance staff training and development both centrally and locally across LHDs for public health emergency responses with a focus on building high-level capability in operational management, strategic planning, policy making and epidemiology.

3.1.5 Expand management and leadership training opportunities available to public health response staff to enhance succession planning and career opportunities.

References

Ashcroft P, Lehtinen S, Bonhoeffer S 2022, 'Test-trace-isolate-quarantine (TTIQ) intervention strategies after symptomatic COVID-19 case identification', *PLoS One*, vol. 17, no. 2, e0263597, DOI:10.1371/journal.pone.0263597.

Australian Government 2021, *AHPPC statement on testing, tracing, isolating and quarantining in high levels of COVID-19 community transmission*, 30 December, Department of Health and Aged Care, <www.health.gov.au/news/ahppc-statement-on-testing-tracing-isolating-and-quarantining-in-high-levels-of-covid-19-community-transmission>.

Dyal JW, Grant MP, Broadwater K et al 2020, 'COVID-19 Among Workers in Meat and Poultry Processing Facilities – 19 States, April 2020', *Morb Mortal Wkly Rep*, vol. 69, no. 18, pp. 557-61, DOI:10.15585/mmwr.mm6918e3.

Organisation for Economic Co-operation and Development (OECD) 2020, *Food Supply Chains and COVID-19: Impacts and Policy Lessons*, OECD, <www.oecd.org/coronavirus/policy-responses/food-supply-chains-and-covid-19-impacts-and-policy-lessons-71b57aea/>.

Shearer FM, McCaw JM, Ryan G et al 2022, *Estimating the impact of test-trace-isolate-quarantine systems on SARS-CoV-2 transmission in Australia* (unpublished draft).

3.2

Epidemiology, surveillance and reporting

A cornerstone of prevention and control measures during a pandemic is epidemiological surveillance and reporting. Surveillance is "the ongoing systematic collection, analysis, interpretation and dissemination of data regarding a health-related event; to inform public health action" (Ibrahim et al. 2009). COVID-19 surveillance involves monitoring the spread of the disease to identify patterns of transmission – and for application of preventive and control measures – but can also extend to better understanding health system and community impacts (WHO 2020).

The context

NSW produced high-quality epidemiological analyses throughout the pandemic. The Epidemiology and Surveillance Team were foundational to the public health response, providing a continuous and consistent daily data supply, report production, and answers to key epidemiological questions that enabled the rapid evidence-informed decision making necessary to respond to the evolving pandemic.

The team was initially part of the Operations Team of the PHEOC under the emergency management structures before emerging as a separate team as part of PHRB in mid-2020 to provide dedicated data management, epidemiological reporting, surveillance, data acquisition, and data quality and governance capabilities. It provided data to NSW Health and government partners and synthesised data from a range of sources to support the NSW Health and whole-of-government response to the pandemic. This provided an evidence base to inform the operational response and policy settings within PHRB, LHDs and other NSW Health divisions, as well as other government departments and organisations.

One of the first tasks at the start of the pandemic was the creation of appropriate case definitions and data fields for COVID-19 in the NSW Notifiable Conditions Information Management System (NCIMS), the system used to capture notifiable conditions data under the NSW *Public Health Act 2010*. A case questionnaire was developed and refined over time to collect relevant case information. Specific data assets for COVID-19 were created as updates needed to be faster than for other notifiable conditions, on a greater scale, and with much greater flexibility to adapt to the changing context of the response. Close collaboration with the NCIMS Team (spanning the Communicable Diseases Branch in HPNSW, and CEE) was essential in preparing hourly COVID-19 case notification data and enabling greater access for Epidemiology and Surveillance Team members to interact with live reporting data. LHDs played a critical role in the COVID-19 surveillance system, centred around entering case data into NCIMS and responsibility for local reporting. An emerging challenge was the ability to process COVID-19 testing data from private and public laboratories into NCIMS and for this to be automated at scale.

Following creation of PHRB the new Epidemiology and Surveillance Team opted to use the open-source statistical computing software 'R', given its ease of use, flexibility, expressive nature, and ability to produce modern (semi)-automated reports and dashboards in various formats (Microsoft Word, PDF and HTML). The number of reports, datasets and data requests grew rapidly, and a centralised codebase was created to ensure consistency across outputs.

Data was central to the public discourse on COVID-19, with the daily 'numbers' a focal point of press conferences and media attention. This created a high-pressure environment in which new data analyses were required and additional data sources were added to inform public health action and public reporting throughout, often at the request of the media.

Key functions of the Epidemiology and Surveillance Team in the initial phases of the pandemic included:

Data management

- Development of case questionnaires and surveillance definitions (e.g. case classification, place of acquisition, active cases, and settings of exposure) within NCIMS.
- Establishment of Data Quality and Data Acquisition teams in March 2020; the Data Quality Team assisted with NCIMS workflows, person deduplication and data entry, while the Data Acquisition Team was responsible for data pipeline and preparation.
- Provision of NCIMS data to the Patient Flow Portal in March 2020 to link to hospitalisation data to ascertain health outcomes.
- Liaison with other state and territory health departments and the development of cross-border surveillance protocols.
- Inclusion of negative COVID-19 tests in NCIMS. This was the first time negative results had been reported in NCIMS for any condition. Due to the burden of results impacting the functionality of NCIMS, a separate database was developed in 2021 to store all negative COVID-19 results.

Analysis and reporting

- Establishment of reporting processes for cases, contacts and tests, including daily reporting of case and testing numbers consistent with nationally-agreed definitions.

- Weekly COVID-19 surveillance reporting commencing at the end of April 2020.
- Reporting of COVID-19 surveillance testing (saliva testing) for workers in NSW's quarantine system from December 2020.
- Reporting of COVID-19 sewage surveillance.

Surveillance

- Development and analysis of recovery interview data to better understand the natural progression of the disease and health burden and to feed into the study of the first 200 cases.

As the pandemic progressed important new developments included:

- the requirement to collect, action and report data for a broad range of contexts in response to changing public health response measures and phases of the pandemic, including but not limited to, cases, contacts (household, close and casual), interstate arrivals, quarantine exemptions, essential workers and flight crews
- analysis and reporting of hotel quarantine screening data using flight manifests and testing data (e.g. day 1, day 10) and Day-16 Testing Program in February 2021
- adoption of processes to allow surge staff rapid access to COVID-19 events in NCIMS
- development of the NCIMS data entry guide for COVID-19 and training for surge staff (especially those in CCTT)
- support for the coordination of serological testing to provide additional evidence to confirm a case's COVID-19 infection status, where this was unclear
- provision of all data on the SharePoint snapshot, accessible by PHUs, in mid-2021
- further developments of the NCIMS data provision to the Patient Flow Portal to support community care in August 2021
- development of processes to facilitate the increase in volume, frequency and complexity of internal and external reporting requirements. These new and enhanced processes included the creation of snapshot data to support media reporting, development of multiple dashboards, and improved cluster identification and visualisation.

Key developments in 2022 included:

- inclusion of rapid antigen testing self-registration data into the NSW COVID-19 surveillance dataset in January 2022
- cessation of case follow-up and associated data collection (except for high priority settings) in January 2022
- merging the weekly COVID-19 Surveillance Report into a COVID-19 and Influenza Report, given the importance of understanding the combined burden presented by these respiratory illnesses.

Members of the Epidemiology and Surveillance Team represented NSW Health on various national committees and data-related working groups, including the CDNA and the National Surveillance Committee. The team also routinely developed reports and supplied data to a range of internal and external stakeholders, including the public health network, other PHRB teams, media and communications, Agency for Clinical Innovation, Centre for Aboriginal Health, SHEOC, NSW Data Analytics Centre, NSW Health Pathology, public and private laboratories, Kirby Institute, Doherty Institute, Boston Consulting Group, National Incident Room, NSW Ambulance, NSW Police Force, NSW Department of Education, and Service NSW. In addition, the team was, and remains, the sole producer or enabler of all publicly available COVID-19 epidemiological information in NSW through, at various times, daily number updates, weekly epidemiological reports, in-focus reports, and responses to media queries.

From the LHD perspective, some challenges emerged for local epidemiology and surveillance teams, including training surge staff on the use of NCIMS. The stability of NCIMS was variable during the Delta wave due to processing load: in some instances, if NCIMS was down, data needed for reporting and sometimes case and contact work would be temporarily held in Excel spreadsheets and later re-entered into the system. Some LHDs reported issues with NCIMS access, making data entry challenging at a critical point in the pandemic. Several LHDs also reported the need to generate local reports but this functionality was limited to ensure consistent case number reporting. This was resolved by central automated analysis and distribution of case numbers to LHDs.

The centralised approach to data reporting was a more efficient process and ensured a single source of truth in case number reporting centrally and locally.

The critical role CEE played in several epidemiology and surveillance functions of the PHEOC/PHRB is important to recognise. This included:

- acquisition and warehousing of Australian Immunisation Register (AIR) data from the routine internal reporting of COVID-19 vaccination, case and testing data, with services provided seven days a week at some stages of the pandemic. This included development, implementation and handover of routine reporting products, such as geospatial products that visualised case-specific risks across the state
- AIR (vaccination) data provisioning (such as by age, LGA) for a range of stakeholders, including the Data Analytics Centre, Agency for Clinical Innovation, University of NSW, SHEOC, Centre for Aboriginal Health, PHRB, the Burnet Institute, and the National Centre for Immunisation Research and Surveillance (NCIRS). These functions transitioned to the COVID Influenza Branch in May 2022
- contributing staff to PHRB, working across the Epidemiology and Surveillance, Data Acquisition, Data Quality, Operations, and Contact Tracing teams. The CEE approach during the Delta wave in 2021 was to act more as a 'service provider' to PHRB, meaning that staff were retained within CEE but provided a range of epidemiology, surveillance and reporting functions to PHRB and its stakeholders
- producing information and visualisations of COVID-19 case risk mapping by LGA (which informed the selection of LGAs of concern during the peak of the Delta wave) and subsequent monitoring of the impact of interventions in these LGAs. This function transitioned to the PHRB in December 2021
- negotiating and arranging for 56 record linkage projects to address important questions such as case matching for cruise ship and airline passenger manifests; vaccination and booster dose rates in NSW Health employees; hospitalisation rates for people diagnosed with COVID-19; vaccine effectiveness; estimating COVID-19 testing rates in vulnerable populations such as Aboriginal people and people born overseas; ascertaining hospitalisations and deaths associated with COVID-19 for case and contact management; and estimating background rates of adverse events following immunisation
- supporting continuous improvement processes within the Epidemiology and Surveillance Team for routine reporting products and associated visualisations.

CASE STUDY 5
COVID-19 modelling and the Modelling Science Table

Mathematical models of COVID-19 provided important information to NSW Health about the spread of the disease in the population and the impact of intervention measures. During the pandemic, internal COVID-19 modelling conducted by the System Information and Analytics (SIA) Branch was supplemented by modelling from several external modelling teams.

The NSW Health COVID-19 Modelling Science Table (MST) was formed in July 2021 as a joint initiative between the NSW Health Critical Intelligence Unit and the Centre for Epidemiology and Evidence to support interpretation of statistical models that provide projections of COVID-19 cases, hospitalisations, ICU admissions and deaths.

Outputs from five modelling teams were considered by the MST in 2021, including the University of NSW/University of Melbourne, Burnet Institute, NSW Ministry of Health (SIA), Finity and the Sax Institute. MST meetings occur weekly or as necessary and advice has been provided to NSW Health policy teams, Executive and NSW Government. Membership of the MST includes senior officers from the Population and Public Health Division, Patient Experience and System Performance Division, and Agency for Clinical Innovation, along with key external academics.

The MST has proven to be a useful mechanism for collaboration and coordination across NSW Health divisions and agencies on COVID-19 modelling matters.

CASE STUDY 6
Whole genome sequencing to track COVID-19

The COVID-19 pandemic required high-resolution tracking of importations and virus spread in the community and high-risk settings.

The Public Health Microbial Genomics Unit at Westmead Hospital was established as a collaboration between the Centre for Infectious Diseases and Microbiology-Public Health, NSW Health Pathology – Institute of Clinical Pathology and Medical Research, and the Sydney Infectious Diseases Institute at the University of Sydney. The team of clinicians and researchers developed, evaluated and implemented prospective, near-real-time public health genomic surveillance of SARS-CoV-2 in NSW to provide timely recognition of multiple independent importations of COVID-19 into NSW, as well as clusters of local transmission. These activities were supported by the NSW Health Prevention Research Support Program and a COVID-19 Priority Research Grant.

This research determined the sensitivity and specificity of different methodologies to generate SARS-CoV-2 whole genome sequences. The most sensitive and reliable workflow was implemented into laboratory testing in late 2020, increasing the ability to generate complete genomes from 13% to 40% of all COVID-19 cases in NSW at that time.

The Public Health Pathogen Genomics Team sequenced the first genome responsible for the first case of COVID-19 in NSW in January 2020. They have sequenced over 30,000 genomes since, reporting new variants, clusters and transmission links to NSW Health.

Funding from NSW Health provided next-generation sequencing equipment and, with it, capacity to explore diseases of public health concern such as COVID-19, building capability vital to NSW and Australia's pandemic response. The grant funded translational research into new testing methods that boosted the numbers of samples that could be successfully sequenced. The strong integration of genomic surveillance into the public health response for COVID-19 in NSW has been proven to deliver the best value for the community.

Additional dimensions to the epidemiology and surveillance systems included:

- monitoring adverse events from COVID-19 vaccination
- whole genome sequencing to track COVID-19
- COVID-19 modelling and the Modelling Science Table.

In addition to in-house and national modelling during the Delta wave, the University of NSW and Burnet Institute were commissioned by the public health response to provide modelling for NSW Health. CEE, along with the Critical Intelligence Unit, established the NSW Health COVID-19 Modelling Science Table in July 2021 to support interpretation of statistical models that provide projections of COVID-19 cases, hospitalisations, ICU admissions and deaths (see Case Study 5). This initiative continues to operate.

Establishment of an enhanced system for monitoring adverse events following COVID-19 vaccination – in collaboration with the TGA, NCIRS, Chief Forensic Pathologist and key clinicians across a range of other disciplines – was another key achievement (see Case Study 16 in Chapter 5.3).

Early in the pandemic, a collaboration between the Centre for Infectious Diseases and Microbiology-Public Health, NSW Health Pathology – Institute of Clinical Pathology and Medical Research, and the Sydney Institute for Infectious Diseases of the University of Sydney developed, evaluated and implemented prospective, near-real-time public health genomic surveillance of SARS-CoV-2 in NSW. The public health response was provided with timely genomic data that enabled recognition of multiple independent importations of COVID-19 into NSW, clusters of local transmission and emergence of new variants in the NSW context (see Case Study 6).

Important lessons on major drivers of transmission and public health and social measures emerged throughout the pandemic

TTIQ practices informed the identification of significant drivers of SARS-CoV-2 transmission in NSW across the COVID-19 pandemic.

Households, particularly large households and crowded indoor settings with poor ventilation and increased aerosolisation, are associated with increased transmission risk.

Throughout the different variant waves, households have been a consistent transmission driver. An analysis of locally-acquired cases in NSW between July and October 2020 found that approximately one in every four household contacts of COVID-19 cases became infected (Sordo et al. 2022). In August 2021, it was reported that 70% of COVID-19 cases linked to known cases or clusters were transmitted by household contacts (PHRB 2021). During this time there was disproportionate transmission within households located in 'hotspot' areas which included areas of socioeconomic disadvantage, large households of multi-generational families, and where English was not the first language. Evidence from the UK's Scientific Advisory Group for Emergencies (SAGE) supports that there is an increased risk of transmission of COVID-19 within larger, multi-generational households (Thelwall et al. 2021). Household transmission, particularly among essential workers, was demonstrated to be an important factor in the population-level growth of COVID-19. NSW also saw clusters emerging in situations where essential workers shared accommodation and traveled and socialised together.

Significant transmission also occurred in high-risk indoor settings such as hospitality venues, specific workplaces (such as cold storage facilities) and – with later variants – in schools. Specifically, an analysis of an outbreak within a NSW church highlighted the risk of transmission in indoor settings, particularly driven by singing/shouting generating more respiratory aerosol particles and minimal ventilation in crowded spaces (Katelaris et al. 2021). In addition, with the emergence of the Omicron variant and a reduction in public health and social measures in late 2021, significant transmission occurred within crowded indoor settings such as nightclubs (Liu et al. 2022).

Poor ventilation, close and prolonged contact, and aerosolising activities such as singing, shouting and exertion, all contribute to significant transmission.

Interpreting the effectiveness of public health and social measures is complex, requiring nuanced analysis of multiple concurrent and interdependent factors.

This includes but is not limited to the prevailing COVID-19 variant and its characteristics, the community context at the time, vaccination and use of contact tracing systems.

Much has been learned over the pandemic and there is a growing body of studies in the academic literature examining the effectiveness of non-pharmaceutical interventions and social measures in Australia and internationally (Adekunle et al. 2020; Haug et al. 2020; Li et al. 2022; Stobart and Duckett 2022). Policy is also reflective of emerging consensus on effective measures, for example the Commonwealth Government's policy framework, *COVID Escalation Tiers and Aged Care Provider Responses* (2020) that includes social and other measures to minimise transmission, morbidity and mortality in this high-risk setting.

Nonetheless, it remains methodologically challenging to be definitive about the relative effectiveness of individual restriction measures considered in isolation.

Key learnings and achievements

The breadth, depth and responsiveness of epidemiological reporting throughout the pandemic was a significant achievement

Collectively, the creation of such a comprehensive COVID-19 data ecosystem in a truly responsive fashion was a significant achievement. It was only possible due to the determination and skills of those working in the PHRB Epidemiology and Surveillance Team, with support of key partners including LHDs, CEE, eHealth NSW and the Rapid Critical Care Surveillance Project Control Group.

A long-term and significant investment in information systems and epidemiological and statistical capability was an important enabler

The ability to complete this, at times, overwhelming task was enabled by a long-term and significant investment in information systems and epidemiological and statistical capability by the

NSW Ministry of Health's Population and Public Health Division. This was largely built through a long-term investment in training programs, with a large proportion of Epidemiology and Surveillance staff in PHRB being either current or former members of the NSW Public Health and Biostatistics Training Programs.

Meeting diverse expectations was a challenge for reporting

A key challenge for the Epidemiology and Surveillance Team was managing expectations around what reporting is possible when using surveillance data. Frequent requests for information and data from media, PHUs, NSW Health partners and across NSW Government as cases increased exponentially meant it was no longer feasible to collect comprehensive individual case data in NCIMS. This then limited the team's ability to extract and produce the same comprehensive reports they had previously. It is important to understand the information and data needs of stakeholders and tailor reports accordingly within a prioritisation framework.

Changing surveillance definitions over time had implications for mapping of information and process flows

Another key challenge was frequently changing surveillance definitions which had both operational and data management implications both centrally and locally. This required constant remapping of information and process flows. A strategic view of surveillance and reporting changes and their implications was required to ensure the efficient use of team resources. Respondents reflected that any proposed changes should always be accompanied by a clear rationale and assessment of downstream implications.

Maintaining an agreed single source of truth for case reporting and data quality is important

A key role of the Epidemiology and Surveillance Team was to build and continually improve reporting functionality in response to stakeholder needs. An example of this challenge was the perceived inconsistency in case and testing numbers generated through NCIMS. NCIMS is designed as an operational 'live' data collection system (i.e. as new information becomes available, the system is updated to reflect our current understanding of the status of communicable diseases). This is challenging when there is a corresponding requirement to report at a point in time to a range of stakeholders, including LHDs, government, media or the public. The risk that inconsistent numbers are reported at slightly different times with different contexts increases.

To address this issue the team developed a consistent reproducible reporting dataset with clear time cut-offs that would drive consistent reporting for media, webpages, and LHD data reports. Initially, PHUs generated their own COVID-19 case data through NCIMS. To ensure consistent numbers were being used across NSW Health and by government, central daily data snapshots were created on the SharePoint server.

Maintaining data quality and consistency in reporting was vital to having confidence in the accuracy of the data. Having a data feedback loop with PHUs helped in their understanding of reporting requirements and maintaining good quality data, and helped the team get on the 'front foot' (e.g. the accuracy of case residency data to inform LGA measures).

NCIMS was used to full capacity

Due to the exponential increase in the volume of records processed in NCIMS (cases, contacts, and both positive and negative tests), it is no surprise that its capability was tested across 2021. While short-term system enhancements were implemented, a significant learning was that the system needs to be future-proofed and key person risk in the administration of the system must be addressed.

In addition, it became clear that a longer-term investment in a fit-for-purpose contemporary notifiable infectious disease information system was required. In light of this, work on a new system, SIGNAL, is currently being progressed.

Recruitment was a challenge but bringing people with diverse skills together was critical to innovation

Acquiring and retaining personnel with necessary epidemiological and surveillance skills was challenging throughout the pandemic. Several strategies were used, including targeted recruitment of training program alumni, targeted recruitment of university staff with epidemiological expertise through university onboarding agreements, redeploying NSW Health Biostatistics Trainees, recruiting university students, and embedding academic staff and other researchers in the team.

An effective Epidemiology and Surveillance Team needs diverse skillsets, including epidemiology, biostatistics, data management and communication. Hiring staff with the right skillsets from diverse sectors – and not constraining requirements to typical/traditional public health epidemiological experience – led to greater innovation in the Epidemiology and Surveillance Team. Chapter 5.2 (*Workforce capability and surge capacity*) identifies epidemiology and surveillance as a key area for capability development.

Collaborative tools are essential

The use of a common communication platform (Microsoft Teams) and a common codebase (using the software R for analysis and reporting) was essential in ensuring the team could respond to the pace of change.

Knowing your target audiences is critical

Developing key epidemiological indicators requires situational awareness to ensure that information is provided to the right audience at the right time. The COVID-19 response highlighted the importance of effective communication of epidemiological data to multiple audiences, including public health officials, NSW Health Executive, government and the public. This not only requires epidemiological and biostatistical capability, but also specialist expertise in data visualisation and communication of insights derived from data.

Effective collaboration between PHRB and CEE was critical to effective pandemic surveillance

The CEE was well placed to provide specialist data linkage and analytics capability required to develop new data reports and indicators. When CEE owned a portfolio of COVID-19 epidemiological work (such as case risk mapping or AIR data provision) they established methods, reporting mechanisms, and governance and quality control processes which they then transitioned to the Epidemiology and Surveillance Team as a complete package for ongoing implementation. Respondents thought this was a more efficient use of finite CEE resources than CEE staff being deployed directly into the Epidemiology and Surveillance Team.

The location of the Centre for Health Record Linkage within CEE enabled fast tracking of COVID-19 linkage projects. Furthermore, the significant expertise of the Population Health Data Warehouse Team was vital in facilitating efficient data linkage processes for both public health response epidemiological and reporting purposes and for priority COVID-19 research projects. Being able to rapidly manage issues relating to data and reporting supply chains requires staff who can traverse both technical and policy domains.

CEE support for COVID-19 modelling and contract management of modelling teams allowed the Epidemiology and Surveillance Team to focus on core business during the Delta wave. Respondents reported that mathematical modelling can be a useful forecasting tool for estimating cases, hospitalisations and intensive care burden during a pandemic and, when done well, can inform decision making.

Reflecting on the ongoing utility of data fields in NCIMS is required

Since the beginning of the pandemic the number of COVID-19 data fields in NCIMS has grown exponentially. A systematic process of reflecting whether there is an ongoing need for these data fields is needed.

Transition to business as usual data governance arrangements is required

It is timely to align COVID-19 data release and governance processes with BAU governance arrangements in the transition towards an endemic state of COVID-19. HPNSW should review mechanisms for data sharing with key partners to determine their ongoing policy relevance and appropriateness.

Recommendations

Now

3.2.1 Significantly enhance data management, epidemiological and biostatistical capability in HPNSW and include a mechanism to flex this capacity using contingent workforce and academic partners in response to future pandemic surges.

3.2.2 Establish closer links between the epidemiological and surveillance team in HPNSW and other Ministry of Health data and analytics teams, including linking with the NSW Health Data Analytics Advisory Committee.

3.2.3 Implement targeted strategies to attract and retain data management, epidemiological and surveillance staff in HPNSW and LHDs, including offering greater tenure, professional development opportunities, involvement in communities of practice such as the Epidemiology Special Interest Group (EpiSig), and research.

3.2.4 Align processes for release and management of COVID-19 data with BAU data governance processes.

3.2.5 Review COVID-19 data fields collected through NCIMS to determine their ongoing relevance to pandemic response surveillance and reporting.

3.2.6 Maintain mathematical modelling capability for COVID-19 and other relevant infectious diseases as an important horizon scanning and pandemic planning tool.

3.2.7 Transition administration of NCIMS to eHealth NSW to reduce key person risk associated with the system's administration and to access additional capacity and capability available across the cluster.

Near future

3.2.8 Invest in enduring analytical infrastructure to ensure sustainable arrangements that meet the needs of HPNSW under non-pandemic conditions and to proactively respond to future outbreaks and pandemics.

3.2.9 Enhance the Centre for Health Record Linkage's computing, algorithm matching and clerical review capacity to support timely and high-quality record linkage services for COVID-19 research and surveillance projects.

3.2.10 Maintain the capability of the NCIMS platform and invest in the transition to the enhanced infectious diseases surveillance platform (SIGNAL).

References

Adekunle A, Meehan M, Rojas-Alvarez D et al 2020, 'Delaying the COVID-19 epidemic in Australia: evaluating the effectiveness of international travel bans', *Aust N Z J Public Health*, vol. 44, no. 4, pp. 257-9, DOI: 10.1111/1753-6405.13016.

Commonwealth Government, *COVID Escalation Tiers and Aged Care Provider Responses*, November 2020, <www.health.gov.au/sites/default/files/documents/2020/11/coronavirus-covid-19-national-aged-care-guidance-escalation-tiers-and-aged-care-provider-responses.pdf>.

Haug N, Geyrhofer L, Londei A et al 2020, 'Ranking the effectiveness of worldwide COVID-19 government interventions', *Nat Hum Behav*, vol. 4, no. 12, pp. 1303-12, DOI: 10.1038/s41562-020-01009-0.

Ibrahim NKR, Al Bar HM 2009, 'Surveillance of childhood vaccine-preventable diseases at health facilities in Jeddah, Saudi Arabia', *East Mediterr Health J*, vol. 15, no. 3, pp. 532-43.

Katelaris AL, Wells J, Clark P et al 2021, 'Epidemiologic evidence for airborne transmission of SARS-CoV-2 during church singing, Australia, 2020', *Emerg Infect Dis*, vol. 27, no. 6, pp. 1677-80, DOI: 10.3201/eid2706.210465.

Li Y, Undurraga EA, Zubizarreta JR 2022, 'Effectiveness of localized lockdowns in the COVID-19 pandemic', *Am J Epidemiol*, vol. 191, no. 5, pp. 812-24, DOI: 10.1093/aje/kwac008.

Public Health Response Branch (PHRB) 2021, unpublished data.

Sordo AA, Dunn A, Gardiner ER et al 2022, 'Household transmission of COVID-19 in 2020 in New South Wales, Australia', *Commun Dis Intell (2018)*, vol. 46, DOI: 10.33321/cdi.2022.46.16.

Stobart A, Duckett S 2022, 'Australia's Response to COVID-19', *Health Econ Policy Law*, vol. 17, no.1, pp. 95-106, DOI: 10.1017/S1744133121000244.

Thelwall S, Zaidi A, Nsonwu O et al 2021, The role of multi-generational household clusters in COVID-19 in England, medRxiv, <https://www.medrxiv.org/content/10.1101/2021.11.22.21266540v1> (pre-print).

World Health Organization 2020, *Global surveillance for COVID-19 caused by human infection with COVID-19 virus: interim guidance*, 20 March 2020, <https://apps.who.int/iris/handle/10665/331506>.

4 Priority settings and populations

4.1

Aboriginal people

Aboriginal and Torres Strait Islander people make up 4.2% of the total NSW population and 34.5% of the Aboriginal population of Australia (ABS 2022a). While NSW has a significant metropolitan Aboriginal population, a greater proportion of Aboriginal people reside in rural and remote communities. Aboriginal and Torres Strait Islander people are at higher risk of COVID-19 infection and severe disease outcomes. This is because they experience a high burden of chronic disease and inequities related to healthcare accessibility, poverty, insecure employment and inadequate housing (DHAC 2020). These inequities are exacerbated by the rurality of many Aboriginal communities in NSW (Allan et al. 2022). Moreover, many of the interventions put in place to curb the spread of COVID-19 are countercultural or difficult to implement because of crowded housing and extended family groups living together (Crooks et al. 2020). In addition, Aboriginal people can face barriers to following COVID-19 health advice due to the cost of hand hygiene products and masks, and poor access to clean water in some communities (Yashadhana et al. 2020). Therefore, targeted strategies to protect and support Aboriginal communities are a vital component of an effective public health response.

Prior to the Delta outbreak in NSW no Indigenous Australians had died due to COVID-19 and the virus had not made its way to rural and remote Aboriginal and Torres Strait Islander communities (ABS 2022b; AIHW 2022; Eades et al. 2020). At this point, Aboriginal and Torres Strait Islander people in Australia were underrepresented as a population group among COVID-19 cases (AIHW 2022; Eades et al. 2020). From August 2021, as COVID-19 began to circulate more widely in the community and spread to rural and remote communities, case numbers and deaths among the Aboriginal and Torres Strait Islander population began to increase in line with rates experienced by other disadvantaged groups (ABS 2022c). Other Indigenous populations internationally were disproportionally affected by COVID-19 compared to their wider societies. Overall, this was less so for the Australian Indigenous population (Curtice and Choo 2020; Stanley et al. 2021).

The context

State-level activities to support Aboriginal organisations and communities

In April 2020, a dedicated Centre for Aboriginal Health (CAH) COVID-19 Response Team was established. This team contributed to a broad range of governance, policy, engagement, communication, operational, surveillance and reporting activities. The scale of work required a minimum of two full-time equivalent (FTE) staff working across these activities (surging to approximately eight FTE staff at the end of 2021) with a focus on vaccination and stakeholder engagement during the Delta and Omicron waves.

The CAH COVID-19 Response Team participated in PHRB management and HPLT meetings. The team was also responsible for regular updates to the NSW Minister for Health and NSW Minister for Aboriginal Affairs. In addition, CAH represented NSW Health on NSW Government committees led by Aboriginal Affairs NSW and, at a national level, the Aboriginal and Torres Strait Islander Advisory Group on COVID-19.[1]

CAH provided input into a range of COVID-19 policy decisions, most commonly in partnership with PHRB and SHEOC. Consultation mechanisms were established early and strengthened over the course of the pandemic. The fast-paced nature of decision making and pressure on the Aboriginal health sector during periods of high demand made extensive engagement on policy issues difficult at times. However, where possible, key policy questions were taken to the Aboriginal Health and Medical Research Council (AH&MRC), community groups and other stakeholders for discussion. This formed part of the feedback loop of revision and refinement that COVID-19 policy underwent. Broadly, this work changed in line with the wider COVID-19 response, moving from case and outbreak response to vaccination.

Examples included:

- providing advice/training to contact tracing teams on how to conduct more culturally safe case interviews
- providing input into public health advice around Sorry Business, cross-border workforce issues and travel restrictions
- assisting with scenario testing to inform culturally appropriate outbreak policy.

In addition, CAH was involved in efforts to collect and report data to drive targeted action and communication strategies for Aboriginal people. CAH liaised with data custodians so data on cases by LHD, COVID-19 deaths, and vaccination rates for Aboriginal people was available.

Other activities coordinated at a state level included improvements for testing and vaccination among Aboriginal people. For example, CAH provided advice about the location of pop-up testing centres, testing gaps for Aboriginal people, and strategies to improve testing rates. CAH also supported the establishment of Aboriginal-focused testing centres in priority Aboriginal Community Controlled Health Services (ACCHS) and districts. In addition, CAH facilitated the distribution of rapid antigen tests to ACCHS and LHDs for Aboriginal communities during the Omicron waves. The vaccination rollout in Aboriginal communities was supported through activities such as the establishment of dedicated vaccine hubs and a weekend vaccination blitz for Aboriginal people in September 2021. CAH also worked with general practice and community pharmacy peak groups and stakeholders to support the priority vaccination of Aboriginal people. General practices and pharmacies were identified as high-volume/low-barrier sites for vaccination of Aboriginal populations and so CAH developed an awareness campaign and support materials for practitioners in each sector.

Local health district activities to support Aboriginal people and manage outbreaks

At an LHD level, PHUs worked closely with Aboriginal health units, ACCHS, and clinical service teams to manage outbreaks affecting local Aboriginal communities and to support the clinical response.

[1] The Aboriginal and Torres Strait Islander Advisory Group on COVID-19 was the national advisory group on COVID-19 policy, providing input directly to the Communicable Diseases Network Australia, the Australian Health Protection Principal Committee and the Australian Government. In July 2020, the Advisory Group released the *Management Plan for Aboriginal and Torres Strait Islander Populations* which outlined the roles of national, state and local partners in the clinical and public health response to COVID-19 in Aboriginal communities (DHAC 2020).

CASE STUDY 7
Managing the first outbreak in rural and remote NSW during the Delta wave

The COVID-19 outbreak experienced in Western NSW from 10 August 2021, when the first COVID-19 case was identified in Dubbo, was the first outbreak of the virus in rural and regional NSW. To combat rapidly rising COVID-19 case numbers, a range of service responses were activated, initially in Dubbo and then in surrounding communities as virus transmission occurred.

The timeline for service activation detailed below demonstrates how quickly emergency plans were implemented and resources deployed. In addition, the public health unit surged a contact management team to manage local cases. This team provided general support and advocacy for COVID-19 cases and referred to Mental Health Drug and Alcohol for specific support, where required. The team included a surged Aboriginal workforce, which was invaluable in providing a culturally safe and competent response to the Dubbo community and more broadly across the district.

22 Jul	Establishment of a COVID-19 Call Centre as a central contact point for people living in Western NSW for questions, information and issues relating to COVID-19.
12 Aug	Operationalisation of the COVID Care in the Community program. This included 24/7 care for COVID-positive patients with health concerns, delivered remotely to their home, and providing access to specialised health services and social support.
	Mass COVID-19 testing initiated and in place across all local government areas (LGA) by 18 August. This included a mobile testing team in Dubbo to provide in-reach predominantly to Aboriginal people.
13 Aug	Support for community home isolation through cultural support for Aboriginal patients and their families, provision of food and medication deliveries, and home testing for patients with COVID-19. More than 1,300 food and care packs and 100 kids' packs were delivered.
14 Aug	Initiation of LHD-led health accommodation for patients with COVID-19 and close contacts unable to isolate in their own homes. More than 100 people were accommodated from August 2021 to June 2022. Of these, 22% were homeless and a further 15% were referred due to domestic violence.
17 Aug	Support from the Australian Defence Force (ADF) was provided. The ADF worked with the NSW Police Force to enhance monitoring of compliance with isolation and stay-at-home orders. They also worked with district and other service providers across Western NSW staff mass vaccination clinics.

The outbreak demonstrated the vulnerability of Aboriginal populations to the spread of COVID-19 and how Aboriginal people can be disproportionately impacted. From August to December 2021, there were 1,334 cases in Dubbo LGA and 715 (54%) of these were among Aboriginal people. This was despite Aboriginal people making up only 11% of the total population in the Western NSW Local Health District; in Dubbo itself this figure is 15% (ABS 2016). There were 12 deaths recorded in the Dubbo LGA, 4 (33%) of which were Aboriginal people.

Disadvantaged and vulnerable populations impacted by the outbreak faced significant barriers to compliance with public health measures, including overcrowded housing, homelessness, domestic violence, mental illness, and drug and/or alcohol dependence. Treating and supporting the whole person or family unit (that is, providing food, medication, and social and wellbeing supports in addition to COVID-19 clinical care) rather than treating the disease only, was key to suppressing the virus.

The Tubbagah People of the Wiradjuri Nation are Dubbo's traditional owners

Reference

Australian Bureau of Statistics (ABS) 2016, *Dubbo, Census All persons QuickStats*, <www.abs.gov.au/census/find-census-data/quickstats/2016/10503>.

Again, CAH provided central support to LHDs through weekly teleconferences with Directors of Aboriginal Health. These meetings were modelled on HPLT meetings and allowed decisions to be made based on a constant flow of up-to-date information between the districts and the Ministry of Health. In addition, CAH maintained a dedicated COVID-19 inbox so emerging and critical issues affecting LHDs could be raised out of session.

The nature and timing of outbreaks and differing local geographical contexts meant LHDs responded to outbreaks in different ways. For example, Case Study 7 describes activities implemented under the direction of the Western NSW PHU to manage the first outbreak in rural and remote NSW.

This case study demonstrates the pre-planning, agility and level of coordination between services required to mount a rapid public health response to the outbreak. Despite the efforts of the services involved, Aboriginal people were disproportionately affected by this outbreak.

In another example of local innovation, Hunter New England LHD established a cultural governance model in which Aboriginal representation was embedded within the local public health emergency management structure. Having a dedicated Aboriginal Health Team within this structure enabled the implementation of several priority actions to support Aboriginal people in the LHD (see Case Study 8).

CASE STUDY 8
Establishing a cultural governance model to support public health actions in Hunter New England LHD

Local, state and national pandemic plans suggest that governance arrangements, local decision making and partnerships between public health services and Aboriginal Community Controlled Health Organisations are important for effective and culturally appropriate pandemic responses. However, how representation of Aboriginal people should be established within governance structures is not made clear within these plans.

To address this issue, Aboriginal staff from the Hunter New England Public Health Unit established a cultural governance model. The model embedded cultural governance and accountability within the local public health Incident Control System, ensuring appropriate representation of Aboriginal people at all levels in the local emergency management response. The approach aimed to ensure that Aboriginal people actively participated in shared strategic decision making to develop and implement culturally appropriate and effective public health measures. This approach had not previously existed.

Central also to the model was the establishment of the Public Health Aboriginal Team. This team oversaw several priority actions from April 2020 to January 2022, including:

- developing strategic governance groups, including the Hunter New England Aboriginal Governance Group on COVID-19, Hunter New England Aboriginal Vaccination Steering Committee, and the Hunter New England Aboriginal Data Governance Group
- establishing an Aboriginal Cultural Support Team which received over 7,000 cultural support referrals and supported 3,671 pre-Omicron COVID-19 cases and contacts
- partnering with the Centre for Aboriginal Health and Aboriginal Health and Medical Research Council to develop culturally appropriate COVID-19 communication
- authoring the Hunter New England COVID-19 Response Sub-Plan for Aboriginal Communities.

This work highlights the importance of Aboriginal people leading and changing the system, to develop a cultural governance model that privileges Aboriginal voices in a pandemic response. The model was shared at national, state and local levels, including being presented at the Australian Public Health Conference 2020, the Public Health Association of Australia Conference 2022, and the Health, Race and Racism International Conference 2022. It can be replicated by other local health districts, particularly for notifiable disease response and any large-scale emergency responses.

One of these actions was the provision of cultural support for Aboriginal people who had contracted COVID-19, and their close contacts. The cultural governance model developed was shared, localised and implemented across other LHDs.

Local level activities to support Aboriginal people and manage outbreaks

At a local level, communities with significant Aboriginal populations prepared and enacted local action plans to respond to COVID-19. These were integrated within the public health response through close liaison between CAH, the AH&MRC and ACCHS, as primary partners. The AH&MRC worked with ACCHS staff, mainstream healthcare providers, remote community clinic staff, Aboriginal people, and state and national support organisations to identify risks and obtain the resources required for COVID-19 clinical care (DHAC 2020). CAH regularly met with the AH&MRC to discuss the response, procurement of consumables (e.g. PPE, rapid antigen tests), and workforce support and development.

Addressing community concerns and needs through engagement

Engagement with Aboriginal communities occurred throughout the pandemic. This ensured communities affected by COVID-19 outbreaks were kept up-to-date with the latest information. These activities involved strong collaboration between CAH, the Ministry COVID-19 Communications Team, LHDs, Department of Customer Service (DCS), AH&MRC, Aboriginal Affairs NSW and other Aboriginal community stakeholders. For example, CAH participated in a variety of community meetings across the state that were either led by NSW Health or another government agency. In addition, CAH established systems to address COVID-related enquiries and provide rapid and tailored responses to Aboriginal community members, community organisations and other government agencies.

Developing targeted communication strategies

Targeted communication strategies were developed to ensure communications were appropriate and accessible for Aboriginal people. These included the 'Keep Our Mob Safe' campaign, a bespoke communications campaign initiated to support the broader NSW Government COVID-19 media campaign.

Key partners in the development of targeted communications included CAH, the COVID-19 Communications Team, DCS, AH&MRC and Aboriginal Affairs NSW. A First Nations media, communications and events agency was engaged to develop the campaign materials.

The 'Keep Our Mob Safe' campaign used a variety of communication channels to reach Aboriginal people. These included paid advertising across social media as well as on Aboriginal and selected regional television and radio channels. Outdoor, digital and regular print advertising in the Koori Mail and regional newspapers (with supporting editorial) was also used.

Media partnerships with Aboriginal broadcasters (e.g. Koori Radio and NITV) were established to deliver more in-depth information and engage in a relatable way with the community. Activities were scaled up during outbreaks in Aboriginal communities (e.g. Western NSW) and complemented by several innovative strategies, for example 'Aboriginal Yarn Ups' that were held as Facebook events and a music track co-written by Aboriginal recording artists.

Prior to the paid media campaign, CAH developed and produced a range of hard copy resources that were printed and distributed directly to health services across NSW to meet urgent need. Urgent communications (typically social tiles) were also issued to advise specific communities on changes to lockdown requirements and other public health order requirements. In addition, a dedicated Aboriginal Health COVID-19 and Flu page was developed for the NSW Health website to facilitate sharing of information and resources. This was linked to the 'COVID-19 information and advice for Aboriginal people and communities' webpage, which provided information for both the public and health professionals.

Key learnings and achievements

Representation of Aboriginal people in pandemic governance structures is vital to a culturally appropriate response

It is important to make space for Aboriginal communities to define the issues, determine the priorities, and suggest solutions for culturally informed pandemic response strategies.

Privileging First Nations voices – within a culturally appropriate governance structure – to develop and implement planning, response and management protocols, is one way to do this (Crooks et al. 2020). In some PHUs, having Aboriginal people represented in governance structures enabled the development of tailored, culturally safe approaches for detecting and responding to COVID-19 in Aboriginal communities. Respondents also noted the utility of specialised steering committees, such as vaccination steering committees focused on supporting the uptake of COVID-19 vaccination in Aboriginal communities.

Establishing strong partnerships and consultation mechanisms was an important success factor

Establishing consultation mechanisms with the Aboriginal health sector and key Aboriginal health leaders from the start of the pandemic response was important. This allowed for the formation of true partnerships as the pandemic progressed and for Aboriginal representation in decision making and policy development to occur. The maintenance of ongoing communication channels with peak health sector organisations also allowed for key messages to effectively and rapidly reach health sector employees (e.g. general practice and pharmacy staff). Working with the ACCHS sector and providing opportunities for them to tailor responses to the needs of their local communities was particularly important.

The success achieved by bespoke Aboriginal campaigns was also based on strong working partnerships between CAH and the COVID-19 Communications Team, and longstanding collaborations with the AH&MRC, Aboriginal Affairs NSW and DCS. Each partner played to their strengths, allowing for effective collaboration. For example, cultural input was provided by CAH, technical expertise was provided by the COVID-19 Communications Team, and paid media negotiation was managed by DCS. In addition, partnering with a First Nations communication and events agency to develop campaign materials enabled communications to be developed from a place of cultural understanding.

Involving Aboriginal people in the development and translation of public health messages is vital

The involvement of Aboriginal communities was critical to pivoting communication strategies to ensure they met evolving information needs. To achieve this, consultation (focus group testing and research) was required to understand community priorities and concerns; these should not be presumed. Bespoke communication strategies were developed as duplicating general population messaging with Aboriginal artwork did not meet community needs. In addition, Aboriginal community ambassadors (e.g. health professionals, Elders, respected members of the community and local people) were included as messengers for health information. These strategies were effective in building trust, educating and informing communities, resulting in high awareness and uptake of messaging.

Aboriginal people who had COVID-19 (and their families) benefited from cultural support services

Implementation of cultural support for COVID-19 cases and their families was an important component of the response in many LHDs. Successful approaches were family-centred and based on an understanding of how isolation impacted the whole family. Aboriginal staff provided advice and education and referred families to appropriate services as required. This support helped Aboriginal families navigate the health system and interpret health advice in a culturally-and context-specific way and should be incorporated into BAU and future pandemic plans.

The cultural support model was designed for Aboriginal people by Aboriginal people. Accordingly, it is a model of care that is culturally appropriate, holistic and responsive. The success of the model highlights opportunities to build on the work completed during the COVID-19 pandemic, to invest in and strengthen the Aboriginal public health workforce, and to ensure Aboriginal leaders and teams are embedded within all layers of the health system.

Staff redeployments into the health system and public health responses, while necessary, drew resources away from other important Aboriginal health services

The Aboriginal workforce, particularly in rural and remote areas, is subject to a high degree of turnover and unfilled vacancies (DHAC 2020). Staffing concurrent components of the response – such as support for cases, testing and vaccination – necessitated the redeployment of existing staff. This meant that Aboriginal Medical Services were often backfilled with non-Aboriginal personnel, and many programs were left understaffed or without staff. This exacerbated inequities in health service access and health outcomes for Aboriginal people over the course of the pandemic (AIHW 2022; Follent et al. 2021). This problem again highlights the need to invest in and expand the Aboriginal health workforce so the needs of Aboriginal people can be met on an ongoing basis and at times of crisis. Strategies to support the maintenance of high priority programs during pandemics are essential.

Health sector staff should be trained in Aboriginal health and culturally safe service delivery

The pandemic highlighted gaps in cultural awareness and understanding of Aboriginal health across many sectors of the health system. For example, frontline staff in primary care settings (e.g. GP practice managers and receptionists, pharmacists and pharmacy staff) would benefit from education and training to deliver culturally appropriate care and to better understand the processes for priority vaccination of Aboriginal people. Similarly, there was a need for non-Aboriginal staff within the public health response to be more familiar with Aboriginal health needs. Lack of skills in this area meant that projects, communications and policy required significant input from dedicated Aboriginal health staff.

Data collection on Aboriginality is required to support public health decision making

Aboriginality was not routinely collected at the time of testing. This was initially addressed by regular data linkage to allow analysis of testing patterns. However, as pressure on data linkage services increased the practice was stepped down. Subsequently, the visibility of Aboriginal case numbers was reduced as Delta and Omicron surged, and comprehensive case follow-up was not possible. Such gaps highlight that data collection processes to monitor and respond to outbreaks in Aboriginal communities should be embedded in all public health response standard operating procedures. To ensure evidence is used to inform public health decision making, the collection of accurate information on Aboriginality should be strengthened across data collections.

Without this, it is not possible to determine if pandemic responses are working equitably for Aboriginal populations in real time. It is also difficult to identify emerging hotspots for infections and the need for taking preventive actions (Carroll et al. 2021).

In addition, developing Aboriginal surveillance strategies that make sense to Aboriginal people is important. Including Aboriginal experts within surveillance teams was reported by respondents to be an important solution to address this issue. It enabled cultural perspectives including kinship networks and tribal boundaries to be understood, increasing understanding of transmission and priorities for communities. It also allowed data and reporting needs of Aboriginal partners and stakeholders to be better understood so important data was shared to inform testing, vaccination and supports. In addition, involvement of Aboriginal staff strengthened the discourse about Aboriginal people in data analysis and reporting, moving away from a deficit lens to supporting existing networks and capacities.

Recommendations

Now	
4.1.1	Enhance training of the public health response workforce in Aboriginal health and culturally appropriate policy and program development.
4.1.2	Explore processes to improve demographic data collection, including Aboriginality, in case management systems and other relevant data collections.
4.1.3	Investigate the utility of the Australian Immunisation Register linked to the Multi-Agency Data Integration Project (AIR-MADIP) as a tool to provide timely data on immunisation uptake by Aboriginality.
Near future	
4.1.4	Continue consultation with Aboriginal communities to ensure communications are focused on priority messaging, are salient, and engage appropriate community champions who are recognised and accepted within the community.
4.1.5	Work in partnership with the Commonwealth, medical colleges and professional organisations to implement strategies to improve the cultural competence of staff working in primary care settings.
4.1.6	Ensure pandemic preparedness exercises include consideration of action in different settings (metro and rural) and with diverse populations, including Aboriginal and culturally and linguistically diverse populations.
4.1.7	Build on investment in the Aboriginal workforce made during the COVID-19 pandemic, and further strengthen Aboriginal public health workforce participation such that Aboriginal public health personnel are engaged to co-design relevant aspects of the public health response across the health system and are broadly embedded across organisational structures.
Future pandemics	
4.1.8	NSW Health to lead a community of practice across NSW Government, Health and the community-controlled sector to engage Aboriginal people, develop communication materials, and share accurate and culturally appropriate information in a timely fashion.
4.1.9	Ensure Aboriginal people continue to be represented within pandemic governance structures both centrally and locally, so the needs of Aboriginal people are included in decision-making processes and policy development.
4.1.10	Consider how emergency management structures could further facilitate input from Aboriginal people in a pandemic response.

References

Allan J, Kleinschafer J, Saksena T et al 2022, 'A comparison of rural Australian First Nations and Non-First Nations survey responses to COVID-19 risks and impacts: implications for health communications', *BMC Public Health*, vol. 22, no. 1, p. 1276, DOI: 10.1186/s12889-022-13643-6.

Australian Bureau of Statistics (ABS) 2022a, *Estimates of Aboriginal and Torres Strait Islander Australians, Preliminary 2021 Census-based estimated resident population of Aboriginal and Torres Strait Islander and non-Indigenous Australians*, released 21 September 2022, <www.abs.gov.au/statistics/people/aboriginal-and-torres-strait-islander-peoples/estimates-aboriginal-and-torres-strait-islander-australians/jun-2021>.

Australian Bureau of Statistics (ABS) 2022b, *COVID-19 Mortality in Australia: Deaths registered until 30 November 2022*, released 22 December 2022, <https://www.abs.gov.au/articles/covid-19-mortality-australia-deaths-registered-until-30-november-2022>.

Australian Bureau of Statistics (ABS) 2022c, *COVID-19 Mortality by wave*, released 16 November 2022, <www.abs.gov.au/articles/covid-19-mortality-wave>.

Australian Institute of Health and Welfare (AIHW) 2022, *Australia's health 2022: data insights*, catalogue number AUS 240, Australia's health series number 18, AIHW, Australian Government.

Carroll SR, Akee R, Chung P et al 2021, 'Indigenous Peoples' Data During COVID-19: From External to Internal', *Front Sociol*, vol. 6, pp. 617895, DOI: 10.3389/fsoc.2021.617895.

Crooks K, Casey D, Ward JS 2020, 'First Nations peoples leading the way in COVID-19 pandemic planning, response and management', *Med J Aust*, vol. 213, no. 4, pp. 151-52.e1, DOI: 10.5694/mja2.50704.

Curtice K, Choo E 2020, 'Indigenous populations: left behind in the COVID-19 response', *Lancet*, vol. 395, no. 10239, p. 1753, DOI: 10.1016/S0140-6736(20)31242-3.

Department of Health and Aged Care (DHAC) 2020, *Australian Health Sector Emergency Response Plan for Novel Coronavirus (COVID-19): Management Plan for Aboriginal and Torres Strait Islander Populations*, Commonwealth of Australia, Canberra.

Eades S, Eades F, McCaullay D et al 2020, 'Australia's First Nations' response to the COVID-19 pandemic', *Lancet*, vol. 396, no. 10246, pp. 237-8, DOI: 10.1016/S0140-6736(20)31545-2.

Follent D, Paulson C, Orcher P et al 2021, 'The indirect impacts of COVID-19 on Aboriginal communities across New South Wales', *Med J Aust*, vol. 214, no. 5, pp. 199-200.e1, DOI: 10.5694/mja2.50948.

Stanley F, Langton M, Ward J et al 2021, 'Australian First Nations response to the pandemic: A dramatic reversal of the 'gap'', *J Paediatr Child Health*, vol. 57, no. 12, pp. 1853-6, DOI: 10.1111/jpc.15701.

Yashadhana A, Pollard-Wharton N, Zwi AB et al 2020, 'Indigenous Australians at increased risk of COVID-19 due to existing health and socioeconomic inequities', *Lancet Reg Health West Pac*, vol. 1, p. 100007.

4.2

Culturally and linguistically diverse communities

NSW has a diverse and multicultural population with almost one-third of residents born overseas and a high proportion speaking a language other than English at home (ABS 2017). Many culturally and linguistically diverse (CALD) people experience higher levels of socioeconomic disadvantage (ABS 2019, Mude et al. 2021), language barriers (McCaffrey et al. 2020), low health literacy, and worse health outcomes, especially for humanitarian migrants (AIHW 2022). Given these challenges and the cultural diversity across NSW, thorough engagement and communication with CALD communities is critical to effective public health action.

For COVID-19 deaths registered by 30 November 2022, the age-standardised death rate in the Australian population was 1.6 times higher for people born overseas (15.7 deaths per 100,000) than for people born in Australia (9.9 deaths per 100,000) (ABS 2022). Of people born overseas, the rate was highest for people born in North Africa and the Middle East (34.9 deaths per 100,000) and lowest for people born in Sub-Saharan Africa (8.9 deaths per 100,000) (ABS 2022).

The context

Including representation of CALD communities in governance structures

The needs of CALD communities were recognised at a state level as a key priority of the NSW Health and public health responses. Staff from the NSW Multicultural Health Communication Service (MHCS) were embedded in the Ministry Communications Team, established within the SHEOC. Multicultural NSW was responsible for coordinating the multicultural response to COVID-19 in partnership with other state health emergency operations central agencies, including NSW Health. Both the Ministry Communications Team and Multicultural NSW worked closely with PHRB to deliver targeted public health messaging and engagement with CALD communities.

Some LHDs also established CALD governance structures, such as Advisory Groups, whose advice fed into LHD emergency management structures. These important local governance structures that engaged CALD communities would have benefited in some instances from stronger linkages with the central emergency response to ensure local context was effectively considered in statewide decision making.

Using partnerships and networks at state and local levels to engage CALD communities

The NSW public health response built on existing health networks and relationships at state and local levels to engage with CALD communities. For example, the MHCS existed before the pandemic to provide culturally appropriate health information and communication initiatives for CALD communities and had extensive relationships with CALD community groups. These networks, and those developed by multicultural health units and refugee health services within LHDs, were engaged to help design, deliver and disseminate COVID-19 health information to CALD communities. In addition, PHUs and population health services within LHDs drew on existing relationships or developed new relationships with community organisations and leaders to engage with CALD communities. For instance, Western Sydney LHD identified an urgent community need for trusted, accessible, culturally and linguistically appropriate information. To address this need, the LHD employed a model based on community empowerment that required communication strategies to be co-designed with the communities of concern. The model, which has a strong partnership and engagement focus, is described in Case Study 9.

Multicultural NSW also led an intensive engagement schedule with existing networks supported by senior officials from NSW Health, the NSW Police Force, DCS and other agencies. This included activating its Regional Advisory Council and Religious Communities Forum online (Multicultural NSW 2021a). Virtual meetings took place throughout the pandemic and provided valuable insights into the impact of the pandemic on CALD communities (Multicultural NSW 2021b). In addition, Multicultural NSW helped organise specific forums with communities particularly impacted by outbreaks or public health orders. These forums brought together key agencies and community leaders to address concerns or relay important public health information. Efforts were made to have consistent NSW Health spokespeople at these forums to build familiarity and trust over time and to ensure the advice provided had as much impact as possible.

Developing bespoke communication materials for specific target groups

The Ministry Communications Team used community insights alongside epidemiological data and intelligence about outbreaks in specific NSW communities to develop tailored communications for community groups hardest hit by COVID-19. For example, in the early stages of the pandemic, communication materials were developed to address racism experienced by the Chinese community. The development of the COVID-19 Hope Toolkit for Pacific Islander families was another example. The Pacific Islander community had some of the highest cases and hospitalisations due to COVID-19 and low rates of vaccination initially. A further example was the development of a CALD Youth Ambassador Program, commencing in 2022, in response to research that showed young people had been significantly socially and economically impacted by COVID-19. The initiative aimed to increase COVID-19 health literacy among young people from CALD backgrounds. It used COVID-safe and vaccination messages co-designed by young people, using their own tone, language and communication channels.

CASE STUDY 9
Enhancing community engagement during COVID-19 in Western Sydney: an equity engagement model

Western Sydney has a population of approximately one million people. Half (46.8%) of the population is born overseas and speaks a language other than English at home, including over 120 other languages (WSLHD 2022). Culturally and linguistically diverse (CALD) communities in Western Sydney were disproportionately impacted by COVID-19, particularly during the Delta wave. Communities had high rates of COVID-19 infection and issues such as social isolation and financial insecurity led to lockdown breaches. High levels of mental fatigue and social stress were present in the community.

To support local COVID-19 communication interventions among CALD communities, Western Sydney Local Health District developed and applied an equity engagement model. It used an equity lens with the aim of reducing COVID-19 spread and providing practical and timely health and wellbeing support for the local community. It was used at key stages of the pandemic to produce Western Sydney-appropriate materials, beyond simple translations. These included a Healthy at Home toolkit (Aug–Oct 2021); living well after lockdown information (Oct–Jan 2022); and managing COVID-19 at home advice (Feb–April 2022).

Key aspects of the model included listening and gathering information about target audiences (e.g. evidence from public health units, dialogue with contact tracers, surveys and interviews); rapid community consultation to identify needs; co-design and testing of materials; messaging delivered by trusted and credible sources; tailored and multichannel dissemination; and evaluation to determine impacts and modification requirements.

Another key feature of the model was engagement with internal and external partners, including Resilience NSW, the Department of Communities and Justice, community champions, local councils, schools and early childhood education centres, Western Sydney Local Health District Aboriginal Health, Corporate Communications, Multicultural Health, Translation Services, Youth Health, the Multicultural Health Communication Service, NSW Health and Multicultural NSW.

Evaluation demonstrated high levels of engagement with materials and increased reach via strengthened partnerships over time. For example, living well after lockdown content reached over 2 million people via NSW Health social channels and the managing COVID-19 at home guide had 589 downloads within three days of launch. The equity engagement model outputs were transferable and adopted by other local health districts and NSW Health.

Reference

Western Sydney Local Health District (WSLHD) 2022, *About us*, NSW Government, <www.wslhd.health.nsw.gov.au/About-Us>.

Ensuring key public health messages reached CALD communities

As well as the development of bespoke communication materials, whole-of-population campaigns were integrated for CALD audiences. CALD advertising comprised 13% of the statewide COVID-19 citizen advertising campaign launched in April 2020. Information from this and subsequent campaigns was translated into multiple languages and ran on multicultural radio, press, social media and digital channels. Social media platforms (Facebook, LinkedIn, Instagram, Twitter, YouTube and WeChat) were also used extensively to reach targeted networks, including multicultural media, community organisations, and multicultural health and community workers.

The development of multilingual resources was another key communication strategy. Over the course of the pandemic, written content was translated into over 60 languages with more than 2,000 resources produced. In-language videos featuring community and religious leaders as well as health professionals were also produced. These were available on the MHCS YouTube channel and shared with stakeholders and the community. Research commissioned by Multicultural NSW found that these actions were widely appreciated by CALD community representatives, as was the practice of engaging key individuals from their community as spokespeople, to get messages out and counteract false information (Multicultural NSW 2022).

During the Delta wave, further strategies to increase accessibility of in-language communication supported compliance with COVID-related public health orders and addressed misinformation about vaccines among the CALD population. This included simultaneous translation of general press conferences through a partnership with SBS. This was the first time this initiative had been undertaken and it ensured that CALD communities were receiving information at the same time as the rest of the community. In addition, the Ministry Communications Team together with the Western Sydney Translations Service began delivering daily COVID-19 key messages in print and audio recordings in multiple languages. In-language media interviews with SBS Radio in up to 18 languages and bespoke in-language community radio explainer audio clips were also produced, focusing on unpacking COVID-19 updates on topics such as vaccination and COVID-safe behaviours. Other novel strategies included adding health advice and communications into welfare food packs distributed to communities.

Addressing low health literacy among some CALD communities

To address low health literacy levels, the Ministry Communications Team used simplified non-expert language in communications, where possible, and delivered information in clear and concise ways to enable better understanding. Audio and video materials were also produced as an alternative to written materials. In addition, MHCS partnered with the University of NSW to develop a glossary of vaccine terms in 31 languages (Seale et al. 2021). The glossary and associated training were launched in July 2021 and were designed to help community organisations, translators and interpreters, bilingual workers and community leaders better understand and communicate information about vaccines with their clients.

Supporting CALD community members and their families who had contracted COVID-19

Providing appropriate support to people from CALD backgrounds who had contracted COVID-19 was a key issue during the pandemic. This support needed to be culturally appropriate and grounded in an understanding of the local context in which people lived. It was particularly required in the LGAs of concern in Sydney during the Delta wave, due to the large CALD populations and high rates of infection in these communities. Where possible, bilingual staff and social workers with knowledge of local welfare referral pathways were employed in case investigation and management teams. However, these staff were in high demand and short supply. Therefore, all staff within the response needed to manage CALD community cases, which could be complex and time consuming. Language barriers necessitating the use of interpreters and the reluctance of some community members to adhere to public health orders for social reasons or fear of losing employment were key issues. Often, complex cases would be escalated to senior PHU staff, adding to the already heavy workloads these staff faced and contributing to burnout and fatigue.

To address these issues, the Western Sydney PHU introduced training modules to help case, contact and management teams understand the Western Sydney context, manage cases in a culturally appropriate way, and initiate appropriate referrals to support services. The modules were developed by a public health-trained university educator and included a blended program of online modules and hands-on training. As another solution, Murrumbidgee and Southern NSW PHU employed a refugee advocate whose role was to assist staff using translators and closely engage with local community organisations.

Key learnings and achievements

Communication materials should be developed with the input of CALD communities

Embedding MHCS team members into the Ministry Communications Team facilitated greater CALD community input on campaign direction, content and strategies. MHCS staff ensured that messaging was appropriately tailored and materials were co-designed with cultural experts during content development. While time consuming, these processes were necessary to ensure information was culturally appropriate and accessible.

Respondents also stressed the importance of listening to community needs and concerns to design appropriate communication materials. This could be managed through formal (interviews with community leaders, qualitative research) or informal (community forums, network meetings) mechanisms but played an important role in informing communication strategies and the public health response in CALD communities.

Insights from public health teams, clinicians and health staff on the ground were also important. Subsequent co-design of materials with community groups and the use of trusted messengers were other effective consultative strategies.

Communication needs vary between CALD communities – a 'one size fits all' approach should be avoided

Another important learning was the considerable diversity of customs and communication preferences within groups of various backgrounds. For example, some groups were very technology literate while some were not; some were distrustful of government messages while some were very trusting of them. This highlights the importance of tailoring messages to the target community. It also suggests that successful communication strategies need to be responsive to different needs and strengths and, again, that engagement with community groups is essential in the design of communication strategies.

It was important to counteract misinformation and ensure communities had access to information from reputable sources

Some CALD communities relied on information about COVID-19 sourced from their countries of origin. The reliability of such information was in many instances questionable and it was often not applicable to the Australian situation. Through social media, inaccurate and sensational messages regarding how the virus was spread, its origins and vaccine safety were being perpetuated in the community (Seale et al. 2021). Specific strategies were required to promptly and consistently counteract misinformation and ensure communities had access to information from reputable sources, given the wide and rapid reach of social media.

Specific strategies to address low health literacy levels were needed

The pandemic highlighted that it cannot be assumed that people from CALD communities have the appropriate level of knowledge, skills and resources to adopt desired behaviours after receiving health information (McCaffery et al. 2020). Rather, specific strategies are required to address low levels of health literacy and to develop bespoke resources that meet community needs.

Further, it is important to acknowledge that there are variations in health literacy levels among community leaders, interpreters and translators. Specific strategies to address these gaps are also required (Seale et al. 2021).

Online environments provided opportunities for engagement with CALD communities at short notice

Online community forums held at short notice were an important vehicle for providing explanations where culturally diverse groups were disproportionately affected by public health restrictions or COVID-19 outbreaks. Connections and relationships between multicultural organisations and communities were used to establish contact with specific community leaders in various locations across the state. These engagement opportunities allowed public health officials to respond quickly to community concerns and relay important public health information. The forums also allowed community groups to air their concerns with authorities, providing a two-way communication that was beneficial to the public health response overall.

Community leaders were credible messengers and helped to counter misinformation

Having access to community leaders as a vehicle to explain the rationale behind restrictions and important COVID-19 messages in a way that resonated with communities was a powerful and effective tool. Response staff at both state and local levels worked alongside prominent community ambassadors such as healthcare workers, GPs and Elders as trusted and respected members of the community to be the source of new information. Settlement staff, case workers and bilingual staff also played a role in synthesising and disseminating information. In addition, religious leaders played a vital role in countering misinformation and communicating restrictions on public gatherings to their congregations. They also led by example during the vaccination rollout, publicly encouraging communities to come forward for vaccinations and offering places of worship as vaccination hubs (Multicultural NSW 2021b).

Respondents noted communication and coordination across different levels of the response (e.g. between media and communications teams, LHDs and Multicultural NSW) was required to ensure the most influential community members were identified in engagement strategies and the most appropriate engagement mechanisms adopted.

Using real-time data about CALD communities helped inform the public health response

Combining community insights with data available through epidemiological and surveillance systems helped to develop strategies with a greater potential to achieve success. Information from PHUs, consumer surveys conducted by DCS, and informal feedback received through community meetings were all important sources of evidence to inform the response. Analysis of demographic characteristics at a postcode level was also used to understand possible reasons for non-compliance with public health orders and low rates of vaccine uptake. However, respondents noted that formal data on cultural background and language spoken at home was not always collected. This hampered efforts to understand whether strategies were effective. Therefore, it is important that data fields at the points of testing, contact tracing, case management and vaccination capture cultural backgrounds and language spoken at home.

Respondents also reported that understanding automated text messages in English was a barrier to following isolation advice for some CALD community members. The feasibility of providing in-language automated text messages merits further investigation for future responses. More information about automated text messaging systems can be found in Chapter 5.5 (*Information systems and capacity*).

Managing considerable cultural diversity and large numbers of CALD community cases was challenging for PHUs

The demographic characteristics of some LHDs meant that PHUs needed to manage large volumes of complex cases, which was time consuming and resource intensive. In addition, each LHD was required to develop targeted models of public health intervention and communications to support priority populations. At times, this had to be done within their existing resources, which added additional workload to already stretched response teams. High workloads impacted staff wellbeing and retention despite efforts to maintain a positive work environment.

Adequate training for response staff to manage CALD community cases was an additional issue. Specific training, including education about the local community, was provided in some LHDs. A mix of both centralised training resources and local training resources would better support CALD engagement. In addition, high staff turnover and staff returning to BAU roles after deployment meant staff, once trained, were not necessarily retained. This put additional pressure on specialist staff (e.g. bilingual staff, social workers) and senior PHU staff. These issues highlight the need for public health workforces to be reflective of the communities they serve, be adequately trained, and include staff with specialist skills (e.g. social workers, multilingual workers and community engagement officers).

Recommendations

Now

4.2.1 Draw on research and approaches used to develop communication strategies for CALD communities during the COVID-19 pandemic to address other existing and emerging health problems.

4.2.2 Explore processes to improve demographic data collection, including country of birth and language spoken at home, in case management systems.

4.2.3 Investigate the utility of the Australian Immunisation Register linked to the Multi-Agency Data Integration Project (AIR-MADIP) as a tool to provide timely data on immunisation uptake by socioeconomic and CALD status.

Near future

4.2.4 Maintain and strengthen relationships developed with CALD communities and partner agencies during the COVID-19 pandemic so these relationships can be drawn upon during current and future public health responses.

4.2.5 Invest in training and development of a multilingual public health workforce.

4.2.6 Invest in further strategies to improve health literacy among CALD communities, including health literacy training for CALD health and community workers.

Future pandemics

4.2.7 Build on the successful engagement with Multicultural NSW and the Multicultural Health Communication Service in future pandemics and seek their support in effective targeting, message development and engagement with CALD communities.

4.2.8 Engage with key CALD communities to understand information needs, barriers to accessing healthcare, changing communication preferences, and how to promote resilience during public health crises.

4.2.9 Ensure that CALD communities have accurate and timely access to public health information concurrently with the whole population.

4.2.10 Provide training for staff working in future responses so they understand the local context impacting CALD communities and provide tailored and culturally appropriate information and referral to necessary services.

4.2.11 Anticipate additional public health response workload and different workforce skill mix requirements in districts with large CALD populations (e.g. bilingual workers, social workers).

References

Australian Bureau of Statistics (ABS) 2017, Census 2016, *Proficiency in Spoken English/Language by Age by Sex (LGA)*, ABS, Canberra.

Australian Bureau of Statistics (ABS) 2019, *Characteristics of recent migrants: Data about migrants arriving in the last 10 years including employment outcomes relating to visa type, birth country, education and language skills*, released 12 June 2020, Australian Bureau of Statistics, Canberra.

Australian Bureau of Statistics (ABS) 2022, *COVID-19 Mortality in Australia: Deaths registered until 30 November 2022*, released 22 December 2022, <www.abs.gov.au/articles/covid-19-mortality-australia-deaths-registered-until-30-november-2022>.

Australian Institute of Health and Welfare (AIHW) 2022, *Australia's health 2022: data insights*, cat. no. AUS 240, Australia's health series number 18, AIHW, Australian Government.

McCaffery KJ, Dodd RH, Cvejic E et al 2020, 'Health literacy and disparities in COVID-19-related knowledge, attitudes, beliefs and behaviours in Australia', *Public Health Res Pract*, vol. 30, no. 4, pp. 30342012, DOI: 10.17061/phrp30342012.

Mude W, Meru C, Njue C et al 2021, 'A cross-sectional study of COVID-19 impacts in culturally and linguistically diverse communities in greater Western Sydney, Australia', *BMC Public Health*, vol. 21, no. 1, pp. 2081, DOI: 10.1186/s12889-021-12172-y.

Multicultural NSW 2021a, *Annual Report 2020–2021*, NSW Government, <https://multicultural.nsw.gov.au/publications/annual-report-2020-21>.

Multicultural NSW 2021b, *Community Relations Report 2020-2021*, NSW Government, <https://multicultural.nsw.gov.au/other-publications/the-state-of-community-relations-in-nsw-community-relations-report-2020-21>.

Multicultural NSW 2022, *Multicultural community feedback on selected aspects of the NSW COVID-19 delta micro strategy* (unpublished).

Seale H, Mahimbo A, Harris-Roxas B et al 2021, 'How can governments communicate with multicultural Australians about COVID vaccines? It's not as simple as having a poster in their language', *The Conversation*, 1 March 2021.

4.3

Education settings

School and early childhood services play a critical role in childhood and adolescent learning, and social and emotional growth. Having these services open safely for face-to-face learning is very important for children, young people, families and the community (NCIRS 2022a) and is also important to address underlying inequity. Schools and early childhood settings remained open throughout the pandemic, even when restrictions were in place for vulnerable children and essential workers.

The NSW public health response in education settings included early childhood education and care (ECEC) services (long daycare services, preschools, family daycare services, outside school hours care services and some vacation care services) and schools (government, catholic and independent schools from kindergarten to year 12). NSW has 1.8 million residents aged ≤18 years and approximately 3,100 schools and 5,800 ECEC services, making these settings central to effective pandemic response (NCIRS 2022a).

Within school settings, boarding schools and schools for specific purposes (SSP) were identified early as higher-risk settings for transmission. SSPs required additional focus, including specific risk mitigation strategies and response protocols, as they enrol children with a wide variety of additional physical, emotional and behavioural needs, including significant physical disability for some children.

While the response also included tertiary education settings such as universities and TAFE campuses, it was less intensive in these settings, with advice provided through support for the development of COVID safety measures and linkage to local PHUs for support. Tertiary education settings will therefore not be a focus in this sub-chapter.

The context

Critical importance of effectively managing educational settings as a high transmission setting

Ensuring ongoing engagement of children in learning was a key focus of work between NSW Health and the NSW Department of Education. Strategies were put in place to minimise transmission in schools and support learning, such as online support and hybrid learning. Throughout the pandemic, there was a focus on communicating the impact of COVID-19 on children, and paediatric research and surveillance were established to generate high-quality local evidence to complement international evidence.

Significant community, government and media interest added to the complexity of formulating appropriate policy in schools and ECEC services and warranted skilled stakeholder engagement and collaboration across government departments. Schools were amongst the first settings in NSW to experience outbreaks in early 2020 and were therefore identified as a high-risk setting. Considerable focus and resources were dedicated to educational settings from both an operational and policy perspective.

Sustained liaison between public health and educational sector leads across non-government and government sectors was crucial to the response. Supported by the NSW Department of Education, liaison with Parents and Citizens groups and Principals Forums was also useful and should be embedded in policy approaches and future pandemic responses. Furthermore, an established relationship between NSW Health and NCIRS enabled the rapid establishment of the schools' transmission study to support evidence-informed policy making in schools and ECEC services (see Case Study 10). These relationships laid the foundation for a strong and ongoing partnership between researchers, public health authorities and education stakeholders, including both government and non-government school sectors and ECEC service regulators.

Policy shifts were at times significant and required a responsive and effective relationship between NSW Health and the NSW Department of Education, as well as integration of both the operational and policy arms of the response to effectively manage the risk while supporting face-to-face learning where possible. By January 2022, a nationally consistent approach had moved towards minimising disruption from COVID-19 in schools and ECEC services and prioritising the wellbeing of children and staff while maintaining baseline public health measures, including in accordance with restrictions and public health orders. The premise was that ECEC services and schools are essential and should be the first to open and the last to close wherever possible in outbreak situations (DESE 2022).

Supporting outbreak management in educational settings – bringing together public health and education

For a significant period of the pandemic, most children in NSW were attending face-to-face learning in schools. Stay-at-home orders between March and May 2020, and again between mid-July and mid-October 2021, saw more than 90% of schoolchildren learning from home at these times. However, schools remained open and ECEC services continued operating throughout the pandemic for those families that needed them, so there was an ongoing need to review policy settings and strengthen outbreak management protocols even during 'lockdown' periods.

Collaboration was essential between public health and the three peak education bodies (Association of Independent Schools of NSW, Catholic Schools NSW and NSW Department of Education) in formulating implementable protocols, streamlining communication pathways, and ensuring consistency in key messaging and approach in education settings. The initial response in schools and ECEC services was resource intensive with specified roles and responsibilities across the peak bodies, PHEOC, local PHU and education facility, and multiple outbreak management team meetings for each case and cluster identified.

Local PHUs were responsible for contact tracing early in the pandemic, and testing was supported by NCIRS while there was limited community testing available for children and households until May 2020. By August 2021, with rapidly increasing case numbers and incursions into schools, contact tracing was shifted centrally into the PHEOC/PHRB as local priorities of PHUs shifted to focus on other high-risk settings with vulnerable populations, such as aged and disability care.

From the start of the pandemic, NSW Health worked very closely with colleagues from the NSW Department of Education, managing outbreaks alongside the Department's Health and Safety

CASE STUDY 10
Using research evidence to inform public health response in childcare and education settings

Since the COVID-19 pandemic began, government officials around the world have had to determine if schools and early childhood education and care services could safely deliver on-campus learning and assess the contribution of schools to transmission of infection. An understanding of virus transmission and emerging variants in education settings was required to make evidence-based decisions.

In early 2020, the National Centre for Immunisation Research and Surveillance (NCIRS) was rapidly commissioned through the NSW Health Emergency Response Priority Research funding stream to investigate COVID-19 cases and exposures in NSW educational settings. This included undertaking contact tracing, enhanced follow-up surveillance and opt-in swab and serology testing of greater than 30,000 close contacts over 2020 and 2021. The pre-existing and long-established close working relationship between researchers, NSW Health and the NSW Department of Education (over many years) enabled rapid commissioning of research, the development of collaborative research protocols that met public health, education and government decision makers' needs, and swift research execution.

The project rapidly produced high-quality, comprehensive findings on transmission rates and risks in education settings that contributed to public health advice and government decisions in NSW, Australia and globally (Macartney et al. 2020). Findings were regularly reported to the Public Health Response Branch, the Department of Education's COVID-19 Taskforce (as part of the NCIRS seminar series), and at numerous conferences. Strategies to reduce transmission risks were developed and implemented in tandem with research findings.

The study confirmed low rates of transmission in educational settings in 2020 and again with the emergence of new variants in 2021. This evidence supported decisions to resume on-campus learning in both 2020 and 2021.

The project supported positive social, educational and economic outcomes, including so that parents and carers could return to work, educational organisations could resume onsite services, and children and young people could resume face-to-face learning sooner, benefiting their education and social wellbeing.

The study continued during the 2021 Delta wave, finding that transmission in schools was still low despite being higher than the ancestral strain. The study also reported higher rates of transmission in staff and supported prioritising teachers and early childhood educators for vaccination and a return to face-to-face learning. The study continued to provide current, quality data to public health authorities, government and parents as Omicron emerged at the end of 2021 and into 2022, allowing on-campus learning to be maintained.

Reference

Macartney K, Quinn HE, Pillsbury AJ et al 2020, 'Transmission of SARS-CoV-2 in Australian educational settings: a prospective cohort study', *Lancet Child Adolesc Health*, vol. 4, no. 11, pp. 807-16, DOI: 10.1016/S2352-4642(20)30251-0.

Directorate. This supported capacity building towards more independent management by the Education Department. In late 2021, the responsibility to risk-assess and communicate isolation/quarantine advice to the school and ECEC community was handed over to the Education Department, with PHRB maintaining an assisting role as required. With changes to the public health orders in December 2021, contact tracing was discontinued in education settings by the first term of 2022, with PHRB and PHUs providing targeted advice for more complex outbreaks and higher-risk settings such as SSPs.

Developing COVID-19 policy and procedures for education settings

Education settings were a rapidly changing and sensitive policy environment. Complex issues arose around managing cross-border issues, boarding schools and SSPs with vulnerable groups of children, as well as stakeholder management challenges due to the mix of public and private peak bodies and providers.

Targeted Incident Action Plans (IAP) and risk assessment matrices were developed based on the learnings from the H1N1 pandemic.

The IAPs were tailored according to age and vulnerability, with ECEC services, primary schools and SSPs managed separately to high schools to account for their unique features, particularly the reduced ability to enforce COVID-safe measures (such as physical distancing, hand hygiene and mask wearing) among younger children, and the fact that most children aged under 12 were not eligible for COVID-19 vaccination until January 2022. The IAPs and risk assessment guidelines changed numerous times throughout the pandemic in response, for example, to levels of community transmission and vaccination rates, but also based on feedback from the public health network and education stakeholders on the practicality of implementation. Additionally, public health advice and guidance was provided around specific education events, inter-school sport competitions and the Higher School Certificate exams, and often extended to developing specific guidelines for implementation.

From a policy perspective, despite most students learning from home between mid-July and mid-October 2021, this period was one of the most intensive in terms of provision of advice to the Department of Education. Operationalising risk mitigation strategies in education settings was incredibly challenging due to the large number of varied settings. Furthermore, public health advice was often sought well in advance of predictions in case numbers or the emergence of new variants of concern to allow planning and communication of information to education communities ahead of face-to-face learning or new school terms starting.

Key learnings and achievements

Sustained liaison between public health and educational sector leads is important

The rapidly changing policy context and frequent requests for advice and information warranted a streamlined communication and escalation pathway between government departments to implement new policy and provide timely advice. One of the key enablers of effective policy making and rapid operationalisation was the existing stakeholder relationship between Health and Education. While challenging due to the rapid changes in policies and operational requirements, this relationship provided a critical platform. The new relationships built and fostered have already enabled a better response to other emerging public health issues beyond COVID-19.

Strong internal linkages between the policy and operational arms of the response ensured joined up engagement and advice in educational settings

The public health liaison lead (senior Ministry of Health medical adviser) regularly linked in with PHRB Operations to provide updates on policy context. By August/September 2021, a need was recognised to work more closely and so the liaison lead worked alongside PHRB Operations to capture implementation challenges and ensure the development of new risk matrices were feasible, evidence based and appropriate to the setting.

Striking the right balance between safety and the least restrictive approaches in educational settings is vital given the importance of face-to-face learning to child development

SARS-CoV-2 transmission rates were low in NSW educational settings during the first COVID-19 epidemic wave. With effective case-contact testing, epidemic management strategies and associated small numbers of attendances while infected, children and teachers did not contribute significantly to COVID-19 transmission via attendance in educational settings (Macartney et al. 2020). During 2021, with the emergence of increasingly transmissible variants and their lineages, primary schools and SSPs represented higher rates of transmission, while the highest risk of transmission stemmed from unvaccinated staff members. Larger outbreaks in schoolchildren were often linked with social, extracurricular and household gatherings as opposed to in-classroom transmission (NCIRS 2022b).

In the context of evolving evidence on both the impact of variants on the severity of illness in children and whether school transmission would amplify community transmission, a precautionary approach was taken from the third term of 2021 into the fourth, with students learning from home. Given the low rate of transmission within schools, more students missed face-to-face learning due to the quarantine requirements of being a school contact rather than from having COVID-19 once onsite learning resumed (NCIRS 2022b). Moreover, the negative impacts experienced by children and the community from school closures outweigh the impact of SARS-CoV-2

infection in schools, which can be minimised using a range of effective strategies (NCIRS 2022b). DCS data from early 2022 indicates that almost 80% of parents were supportive of reintroducing COVID-safe measures if the risk level increases (Research Impact Showcase Presentation 2022), which still includes learning from home for individual schools if warranted. Fortunately, the COVID-19 variants and their lineages experienced so far in this pandemic have not caused serious illness in most children and outbreaks in schools have been able to be effectively controlled with the measures used. Future pandemic responses will need to take a similar approach in striking a balance between disease transmission and the least restrictive strategies in educational settings depending on the evidence available at the time about the infectious agent.

Recommendations

Now

4.3.1 Strengthen and expand the relationship between the Population and Public Health Division and the NSW Department of Education to enable ongoing collaboration between sectors for pandemic response and to link with broader public health issues.

Future pandemics

4.3.2 Initiate a process to define policy and operational roles and responsibilities between the NSW Department of Education, LHDs and central public health response teams.

4.3.3 Invest in partnerships with research groups to enable rapid engagement and implementation of research in schools and early childhood settings to understand drivers of transmission and disease severity to inform policy, risk assessment and public communications.

4.3.4 Retain education settings as a priority setting in future pandemics and continue to develop and adapt risk guidelines and public communications over the course of future responses in line with evidence.

References

Department of Education, Skills and Employment (DESE) 2022, *National Framework for Managing COVID-19 in Schools and Early Childhood Education and Care*, Australian Government, <www.dese.gov.au/covid-19/resources/national-framework-managing-covid19>.

Macartney K, Quinn HE, Pillsbury AJ et al 2020, 'Transmission of SARS-CoV-2 in Australian educational settings: a prospective cohort study', *Lancet Child Adolesc Health*, vol. 4, no. 11, pp. 807-16, DOI: 10.1016/S2352-4642(20)30251-0.

National Centre for Immunisation Research and Surveillance (NCIRS) 2022a, *COVID-19 in schools and early childhood education and care services – the experience in NSW: 16 June to 17 September 2021*, 18 February, <www.ncirs.org.au/sites/default/files/2022-02/NCIRS_NSW_Schools_COVID_Summary_Term%203%202021_Report_18-02-2022_FINAL_0.pdf>.

NSW Research Impact Showcase presentation 2022 (unpublished).

4.4

Residential aged care and disability care settings

Residential aged care

Globally, older people living in residential aged care facilities (RACF) comprise almost half (47%) of all deaths from COVID-19 (Comas-Herrera et al. 2020). Older age and the presence of multiple comorbidities are associated with increased risk of severe disease and death from COVID-19 (Zhou et al. 2020). Along with these characteristics, the substantial prevalence of people with dementia and complex care needs further increases the risk of transmission and the case fatality rate of COVID-19 in this population (Aitken et al. 2021). This risk of transmission is further amplified by the shared communal environments of RACF, which are designed to be home-like. This communal style of living, and difficulty in adhering to physical distancing, has accelerated transmission and spread of infection in many jurisdictions (Aitken et al. 2021).

In Australia, the mortality rate for aged care facility residents is lower than that observed for several other countries (AIHW 2022). In 2020, prior to vaccine availability, 75% of all COVID-related deaths occurred in aged care facility residents; this fell to 17% in 2021.

The context

Complex legal and governance framework in aged care settings

While aged care is predominantly in the domain of the Commonwealth Government, NSW Health, including the public health network, worked together with the Commonwealth to ensure necessary support and care to residents in these high-risk settings, particularly in the context of outbreaks.

RACF are responsible for identifying and following relevant Commonwealth and state-based legislation and regulations. Aged care facilities are also required to follow the *Australian Guidelines for the Prevention and Control of Infection and Healthcare* (ACSQHC 2021) and guidance from state and territory public health authorities. Aged care service providers who are subsidised by the Commonwealth in Australia must also comply with the Aged Care Quality Standards and adhere to the relevant work health and safety legislation in their jurisdiction. COVID-19 amplified the challenge of successfully navigating an already complex governance environment.

The larger aged care service providers also operate across multiple LHDs and jurisdictions. This led to inconsistencies in practice across RACF and created challenges in negotiating adherence to differing public health orders across jurisdictions.

Critical importance of effectively managing residential aged care as a high-risk setting

Early in the pandemic, a *Protocol to support joint management of a COVID-19 outbreak in one or more residential aged care facility (RACF) in NSW* (NSW Health 2020) was agreed between NSW Health and the Commonwealth Government. It outlined the respective roles of the Commonwealth Department of Health and Ageing, the Aged Care Quality and Safety Commission, aged care providers, NSW LHDs, the Clinical Excellence Commission, and SHEOC. This included roles and responsibilities between aged care facilities, LHD clinical services, acute care hospitals, and public health units in relation to matters such as pandemic preparedness, clinical support and outbreak management.

Achieving consensus on the best policy settings for aged care in NSW and providing coordinated clinical and public health support for optimal clinical outcomes was critical yet complex. Decisions on the most appropriate care were made in consultation with clinical staff and residents. This model acknowledged that aged care facilities are residents' homes and that they, like all individuals in the community, have a right to choose their location of care, including at home.

Developing COVID-19 policy and procedures for aged care settings – bringing together multiple policy stakeholders

The Commonwealth, with primary responsibility for aged care policy and standards, had produced more than a dozen COVID-related policy documents for aged care settings. When combined with CDNA guidance and similar NSW policy, this created a complex policy environment with associated challenges in providing clear authoritative public health advice for RACF staff on the ground in the initial phases of the pandemic.

Highly detailed IAPs were initially developed by PHRB to ensure that only essential personnel entered facilities, and to define their roles in managing outbreaks in aged care facilities. There were tight restrictions across facilities as to who could enter and strict lockdown procedures when a case was known, generally involving lockdown of the entire facility in the early phases of the pandemic response.

Respondents reported variation in approaches between PHUs. This was dependent on differing local experience, given that some PHUs or local emergency planning and response units were supporting outreach management of many concurrent outbreaks each week, while others were managing few or none. There was also reportedly a diversity of views across stakeholders as to the most appropriate policy positions on how to manage outbreaks in aged care, and how restrictive these should be, given residents' mental and physical vulnerabilities.

Supporting COVID-19 preparedness and outbreak management in aged care facilities – bringing together public health and clinical support

Consistent communication with LHDs, aged care facilities, and the community about the implications of COVID-19 outbreaks in aged care facilities was essential. A statewide Aged Care/Aged Health Community of Practice (CoP) was rapidly established by the Agency for Clinical Innovation and Health and Social Policy Branch (Aged Care Unit) at the Ministry of Health with membership open to all key district contacts of aged care services, as well as contacts from other relevant services. This CoP prioritised development of guidance to support aged care facilities.

Public health intelligence guided risk assessment-based interventions in aged care facilities. Senior medical advisers in PHRB met with the Council on the Ageing, Department of Communities and Justice, disability care providers, and the CoP. Cross-Branch relationships were forged and worked well, for example between PHRB and the Health and Social Policy Branch around residential disability settings. The latter provided relevant aged care context for public health decision making by PHRB and other key decision makers and was a critical conduit for communicating policy changes to the state's 900 aged care facilities.

SHEOC played a key role, through its aged care and disability leads, in streamlining the approach for clinical and public health to work with residential care facilities. SHEOC was another point of liaison with LHDs and the Commonwealth.

Case Study 11 provides an example of public health expertise coming together with aged care providers to ensure preparedness to protect those living in aged care facilities.

The public health approach in aged care adapted to the changing context

It is important to acknowledge that the approach to risk assessment and public health action in aged care facilities adapted across the course of the pandemic in response to the changing context and considering variant characteristics, vaccine and therapeutic availability, and vaccine uptake. Initial guidance prior to vaccination was more restrictive in nature (DHAC 2020).

However, as vaccination became available and vaccination rates rose in residents and staff, the risk of severe disease was reduced. In response to this, CDNA guidelines released in March 2022 recommended that aged care providers review COVID-19 risk management plans and adjust mitigation measures in response to the benefits associated with high levels of vaccination within RACF and the lower rates of severe disease associated with the Omicron variant (DHAC 2022). This required a transition to a risk-based management approach with a focus on protecting the vulnerable (i.e. residents who are immunocompromised, have comorbidities or are unvaccinated), and to independently responding to and managing COVID-19 outbreaks in a more BAU approach.

Residential disability care

Globally, COVID-19 has exacted a steep toll on certain populations of people with disability and the events that unfolded during the pandemic – including measures to mitigate the spread – posed unique problems and barriers to people with disability (NCD 2021).

Even under non-pandemic conditions, people with disability are more likely than the general population to have health issues, compromised immunity, increased risk of morbidity and comorbidities, and are more likely to die from preventable causes (Cieza et al. 2021). During the early stages of the pandemic in Australia, people with disability, their families and supporters gave accounts of their concerns, with isolation, fear of contracting the virus, lack of access to information, and loss of services among them (Royal Commission into Violence, Abuse, Neglect and Exploitation of People with Disability 2020).

The effectiveness of the COVID-19 response in Australia has been accompanied by significantly lower mortality for people with disability than in some other comparable jurisdictions. For example, in England between January and November 2021, people with disability accounted for 6 out of 10 COVID-related deaths, that is 30,296 of 50,888 deaths (Office for National Statistics 2022). By contrast in Australia, there were 74 COVID-related deaths of people with disability (0.6% of National Disability Insurance Scheme (NDIS) participant cases) from the start of the pandemic until May 2022 (Commonwealth Department of Health 2022).

CASE STUDY 11
'RAC-off COVID': COVID-19 preparedness in local aged care facilities in Western NSW

In 2020, Western NSW Local Health District (WNSWLHD) had 49 non-LHD residential aged care facilities (RACF), with 3,111 Commonwealth-funded beds, independently owned and operated under 28 different organisations. Facilities (spanning almost 500km) ranged in size from 8 to 148 beds, with wide variation in staffing levels and expertise.

The risk of COVID-19 to vulnerable residents in RACF became clear, based on the experiences of other countries and within Australia. In April 2020, the RACF liaison role commenced working closely with providers to minimise the impact of COVID-19 and reduce potential hospitalisations. Sites needed significant support with their COVID-19 preparedness and additional expertise was sourced from a public health clinical nurse consultant and infection prevention and control clinical nurse consultant. Steps taken included:

- conducting readiness assessments for each site
- establishing a virtual community of practice to ensure all sites were up-to-date with current and constantly changing State and Commonwealth guidelines. Additional participants included the primary health network, NSW Ambulance, geriatrician, palliative care, and aged care services
- linking sites to infection prevention and control education via LHD clinical nurse educators/clinical nurse consultants and online education
- distributing a flyer and providing a succinct list of LHD contacts reinforcing the commitment to support RACF
- developing a District outbreak management plan and linking with RACF outbreak management plans, including local plans (and floorplans) and providing feedback where feasible
- conducting desktop exercises to test outbreak management plans and RACF preparedness for an outbreak
- conducting infection prevention and control audits for all sites, with the provision of written recommendations
- delivering the NSW Clinical Excellence Commission's Infection Prevention and Control Train the Trainer program.

Preparedness was put to the test with the first two outbreaks in September 2021. Since that time in ongoing activity, the team:

- streamlines and supports Outbreak Management Team meetings
- provides guidance to RACF on any COVID-19 (and now influenza) related issues
- works through an extensive list of priority actions with the Outbreak Management Team, including personal protective equipment (PPE)/RATs, surge staffing, infection prevention and control processes, updating Advance Care Directives (with a 'COVID lens', to ensure resident/family wishes are known), swabbing/RAT protocols, checking GP availability and oral anti-viral access
- 'troubleshoots' for multiple issues, including sourcing PPE/RATs, arranging WNSWLHD staff to collect swabs, linking with Virtual COVID Care in the Community medical experts, and in one case providing staff.

The Director of Public Health has provided oversight and expert advice to the WNSWLHD team and community of practice, building on her existing relationships with RACF managers. Given that many participants are competitors, achieving open communication has been challenging, however using tools such as Slido for anonymous questions/comments has assisted. Building trust with RACF became the foundation of swift and decisive action when a facility was in outbreak, along with access to the team's collective expertise.

Early preparation work saw most facilities ready for outbreaks, with much improved infection prevention and control practices, risk minimisation and Advance Care Directives. Facility managers were able to call several WNSWLHD staff directly, who worked to keep residents safe within their 'homes'. Benefits of strong, collegial relationships have been realised beyond the scope of COVID-19, with facilities working on other projects with WNSWLHD and the public health network and continuation of the community of practice, including a broadened scope to include other aged care priorities.

A survey of facilities was conducted in November 2020 to test the perceived effectiveness of the support provided: 100% of respondents (n=19) agreed/strongly agreed that they were well prepared for a COVID-positive resident or staff member, and 100% reported that the infection prevention and control audit was very/extremely helpful.

Between September 2021 and July 2022, WNSWLHD supported 104 non-WNSWLHD outbreaks, with a total of 1,037 COVID-positive residents. Forty one residents were transferred to hospital (including several for Sotrovimab infusions).

Structural reforms in the disability care sector brought complexities for an effective response

Rollout of the NDIS in 2016 heralded changes to funding and regulation of residential disability care facilities (RDCF) and the broader sector. Over time the Commonwealth, in partnership with the NSW Government, has assumed significant lead roles and responsibilities in this area. In recent years and pre-pandemic, the NSW Government, led by the Department of Communities and Justice, had been gradually closing the larger RDCF with strategies, supported by the disability sector and consumers, to enable people with disability to live in smaller RDCF ('group homes') or supported independent living (NSW Legislative Council 2018).

That far fewer of the large facilities remained in NSW for people with disability and complex health needs was advantageous for people living with disability, given the public health risks associated with COVID-19 transmission in large congregate settings. RDCF are smaller in size with generally 4–10 residents whereas aged care facilities are much larger, with often more than 100 residents.

Developing new local public health and clinical approaches to support people with disability in the community, including group homes

The NSW Government's COVID-19 testing strategy was inclusive of people with disability from the outset. However, PHUs had not worked extensively with the disability sector to manage annual flu outbreaks in RDCF as they had in RACF. It was recognised that additional support in this setting was warranted. A Disability CoP was established, including service providers beyond Health, and this became a useful vehicle for bringing expertise and interests together. The Health and Social Policy Branch auspiced this CoP and played a significant role in negotiations with the Commonwealth concerning, among others, NDIS implications, and briefing PHEOC/PHRB and SHEOC teams on relevant disability issues.

PHUs maintained operational responsibility for risk reduction and outbreak management. Local public health responses included providing advice to disability sector providers and the Commonwealth on NSW visitor restrictions and use of PPE. In addition, the emerging aged care plans and processes were adapted for RDCF.

NSW Ministry of Health policy teams, the Disability CoP, SHEOC, local PHUs, LHD intellectual disability teams and disability transitional managers established ways to collaborate, bringing public health advice together with an understanding of the unique needs of people with disability in congregate settings, such as RDCF, as well as harder to reach individuals in supported independent living arrangements. This informed service provision and outbreak management, including direct clinical support (e.g. vaccine rollout) with the aim of keeping residents safe and avoiding admissions to hospital. Public health advice was then able to combine with understanding of the unique needs of people with disability in congregate settings, and of harder to reach individuals.

Key learnings and achievements

Sustained liaison between public health teams and relevant clinical communities in aged and disability care settings is vital to effective public health action

The critical importance of liaison and contingency planning between public health, relevant clinical communities and non-government organisations (NGOs) for aged and disability care was underscored as readiness to implement public health actions in a timely way relies heavily on this collaboration under pandemic conditions. Significant planning undertaken by SHEOC and LHDs in the period between the Wuhan and Delta waves contributed to preparedness in aged and disability settings later in the pandemic.

Multiple policy stakeholders came together in the rapidly changing context to develop clear and authoritative advice for COVID-19 policy and procedures. Relationships forged between public health teams, relevant clinical communities in aged and disability care settings, and NGOs were critical to effective public health action and should be sustained.

Striking the right balance between risk and resident quality of life and autonomy is a key consideration in a nuanced public health approach in aged and disability care settings

Many respondents noted that weighing up transmission risk with the impacts of extended restrictions on older Australians in aged care facilities – such as loss of mobility, loss of social interaction and its impact on mental health – was complex. As the pandemic progressed, the importance of striking the right balance became more evident. PHUs pursued

risk assessment approaches to managing COVID-19 outbreaks that aimed for proportionality in balancing safety with fewer restrictions, recognising that extremely restrictive measures for older people are also accompanied by harms.

It is also important to acknowledge that risk assessments by public health teams adapted to the changing context of the pandemic. This occurred as vaccine availability and uptake increased and variant characteristics changed. Different risk assessment policies and processes ensued accordingly. To illustrate, CDNA-informed guidance released in March 2022 included finding the least restrictive, yet effective, approach (DHAC 2022). This brought more nuanced strategies for RACF, including 'cohorting' for residents with similar COVID-19 risk profiles. Management could thus be based on a risk assessment rather than blanket approaches. Many RACF developed these kinds of risk-reduction strategies by practical means, including reshaping floor plans, repurposing common areas, and recruiting outdoor areas, with the aim of providing safety and necessary restrictions alongside compassionate efforts enabling resident movement and human interaction.

People with disability have heterogeneity in risk profiles requiring tailored risk assessments

While many residents with disability remained vulnerable to illness – and this raised significant implications for providing clinical care and managing outbreaks in those settings – respondents noted that the magnitude of transmission risk in RDCF was different to that in much larger aged care facilities housing many more residents who are at more uniform increased risk of severe disease. However, RDCF remain an important congregate setting.

The disability care sector provides services to diverse groups of individuals in a wide range of settings. This means that more tailored risk assessments are required to balance the risks with the benefits of public health measures, including restrictions and public health orders in each specific setting. In addition, there is greater heterogeneity in disability residential arrangements, with generally smaller numbers of residents in these accommodation arrangements. There were reported to be significant challenges in identifying people with disability across the community who lived in supported independent living arrangements and, thus, understanding where emerging risks existed for them.

Providing accessible information for people with disability warrants additional measures during a pandemic response

Some respondents noted that certain people living with disability (e.g. those who are blind or who have low vision) had difficulties accessing public health information, for example on COVID-19 testing. Providing tailored public health information accessible for people with a variety of disabilities warrants additional measures during a pandemic response and needs to be incorporated in BAU responses.

Data sharing regarding public health risk and congregate settings for older people and those with disability should be enhanced in collaboration with the Commonwealth

Several respondents identified substantial gaps in availability of resident demographic, risk factor and service data in aged care and disability settings. Not having access to this data made risk planning and assessment and outbreak management more challenging.

Recommendations

Now

4.4.1 Continue to invest in ongoing relationships between public health, clinical groups, other government agencies, and NGOs in aged and disability care settings to support effective clinical care, vaccination and outbreak management.

4.4.2 Investigate mechanisms in collaboration with the Commonwealth for enhanced data sharing between residential aged care and disability sectors and NSW Health to support the public health and health system response.

Future pandemics

4.4.3 Include consumer perspectives in emergency response policy for residential aged and disability settings to ensure a nuanced balance of safety, risk and personal choice in the context of a communal setting.

4.4.4 Ensure residential aged care and disability continue to be priority settings with effective engagement between the Commonwealth, public health, health system and NGO service providers.

4.4.5 Recognise and plan for the heterogeneity of risk in disability settings in future responses. This requires tailored risk assessment and differs from the assessment and public health action in aged care settings.

References

Australian Commission on Safety and Quality in Health Care (ACSQHC) 2021, *Australian Guidelines for the Prevention and Control of Infection in Healthcare*, <www.safetyandquality.gov.au/sites/default/files/2022-08/australian_guidelines_version_-_v11.12_3_august_2022_0.pdf>.

Australian Institute of Health and Welfare (AIHW) 2022, *Australia's health 2022: data insights*, catalogue number AUS 240, Australia's health series number 18, AIHW, Australian Government, <www.health.gov.au/sites/default/files/documents/2022/02/cdna-national-guidelines-for-the-prevention-control-and-public-health-management-of-covid-19-outbreaks-in-residential-care-facilities-in-australia.pdf>.

Aitken GE, Holmes AL, Ibrahim JE 2021, 'COVID-19 and residential aged care: priorities for optimising preparation and management of outbreaks', *Med J Aust*, vol. 214, no. 1, pp. 6-8.e1, DOI: 10.5694/mja2.50892.

Cieza A, Kamenov K, Al Ghaib OA et al 2021, Consortium "United Nations workstream on COVID-19 disability inclusive health response and recovery", 'Disability and COVID-19: ensuring no one is left behind', *Arch Public Health*, vol. 79, no. 1, p. 148, DOI: 10.1186/s13690-021-00656-7.

Comas-Herrera A, Zalakaín J, Litwin C et al 2020, *Mortality associated with COVID-19 outbreaks in care homes: early international evidence*, London, International Long Term Care Policy Network, accessed July 2020, <https://ltccovid.org/2020/04/12/mortality-associated-with-covid-19-outbreaks-in-care-homes-early-international-evidence/>.

Department of Health and Ageing (DHAC) 2020, *CDNA national guidelines for the prevention, control and public health management of COVID-19 outbreaks in residential aged care facilities in Australia*, Communicable Diseases Network Australia, Australian Government, <www.health.gov.au/sites/default/files/documents/2022/09/national-guidelines-for-the-prevention-control-and-public-health-management-of-outbreaks-of-acute-respiratory-infection-including-covid-19-and-influenza-in-residential-care-facilities.pdf>.

Department of Health and Ageing (DHAC) 2022, *COVID-19 Outbreaks in Residential Care Facilities, Communicable Diseases Network Australia, National Guidelines for the Prevention, Control and Public Health Management of COVID-19 Outbreaks in Residential Care Facilities*, Australian Government, <www.health.gov.au/sites/default/files/documents/2022/02/cdna-national-guidelines-for-the-prevention-control-and-public-health-management-of-covid-19-outbreaks-in-residential-care-facilities-in-australia.pdf>.

National Council on Disability (NCD) 2021, *The Impact of COVID-19 on People with Disabilities*, United States Government, <https://ncd.gov/progressreport/2021/2021-progress-report>.

NSW Health 2020, *Protocol to support joint management of a COVID-19 outbreak in one or more residential aged care facility (RACF) in NSW*, <www.health.nsw.gov.au/Infectious/covid-19/Documents/racf-outbreak-protocol.pdf>.

NSW Legislative Council 2018, *Implementation of the National Disability Insurance Scheme and the provision of disability services in New South Wales*, Portfolio Committee No. 2 – Health and Community Services, <www.parliament.nsw.gov.au/lcdocs/inquiries/2496/Final%20report.pdf>

Office for National Statistics (UK), *Updated estimates of coronavirus (COVID-19) related deaths by disability status, England: 24 January 2020 to 9 March 2022*, accessed 29 August 2022, <www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/coronaviruscovid19relateddeathsbydisabilitystatusenglandandwales/24january2020to9march2022#overview-of-covid-19-related-deaths-by-disability-status>.

Royal Commission into Violence, Abuse, Neglect and Exploitation of People with Disability 2020, *Statement of Concern – the response to the COVID-19 pandemic for people with disability*, <https://disability.royalcommission.gov.au/publications/statement-concern-response-covid-19-pandemic-people-disability>.

Zhou F, Yu T, Du R et al 2020, 'Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study', *Lancet*, no. 395, pp. 1054–62.

4.5

Correctional settings

The prevention and control of COVID-19 in correctional settings was a critical component of the NSW public health response. These settings also entailed high need for service continuity. However, correctional settings – including prisons, jails and police cells, youth detention, and forensic psychiatric facilities – present a multitude of challenges for the prevention and control of COVID-19 (Pearce et al. 2021). These settings can be characterised by overcrowding and poor ventilation, and infectious diseases can be easily transmitted – between prisoners, staff and visitors through facility transfers and staff cross-deployment, and to and from the community via intakes and releases – unless appropriate public health measures are put in place. These conditions, in addition to inherent restrictions on movement and the chronic disease profile of prisoners, make correctional settings high-risk environments for COVID-19 transmission (Beaudry et al. 2020; Penal Reform International 2020).

The context

An extensive pandemic response was mounted in correctional settings involving Corrective Services NSW (CSNSW), Justice Health and Forensic Mental Health Network (JHFMHN), Youth Justice NSW, the Ministry of Health, PHEOC and later PHRB, SHEOC, PHUs, LHDs, Clinical Excellence Commission, private correctional centres, national health providers and other government interagency partners.

Networked approach

The response centred around prevention, early detection, containment and outbreak management. COVID-19 hubs were established at the Metropolitan Remand & Reception Centre, Silverwater Women's Correctional Centre and Cobham Youth Justice Centre. Staff were also a focus, with screening and advice, workplace safety, contact tracing, early adoption of rapid antigen testing for all prior to attending work, and a vaccination program for JHFMHN and partner agency staff.

A networked public health response led by JHFMHN in public prisons included surge workforce training and deployment of staff, case management, a COVID-19 support line, and communicating and actioning rapidly changing public health information to JHFMHN and partner agencies. Other aspects of the response included COVID-19 surveillance and reporting, clinical governance and monitoring of PPE use.

Policy development capability

Substantial policy work was undertaken by PHEOC/PHRB in collaboration with JHFMHN, CSNSW and private providers to adapt public health policy to meet the evolving needs of correctional settings. This included risk assessments of cases and contacts, case and contact management, access to vaccination, and testing approaches. PHRB also provided extensive advice on visitation policy (testing, screening, duration and location of visits) and response support in both public and privately run prisons in NSW. Response support involved advice on case management, isolation settings, treatment needs, contact assessment (e.g. development of risk assessment matrices), cohorting, testing approach to contacts, and other specific policy matters. Support even extended to managing contacts in the court system and providing advice on how to safely release prisoners back into communities.

PHRB worked closely with JHFMHN who provided continuous support for policy development and refinement, and support for outbreak management in collaboration with CSNSW. Outbreak management advice was also provided to private operators such as St Vincent's Hospital, Serco and GEO Group Australia. PHRB also directly engaged with CSNSW and provided assistance and support with policy settings and advice on risk.

During the first 12 months of the pandemic, advice to JHFMHN and CSNSW focused on pandemic preparedness. The increase in community cases –and the first cases in facilities at the Parklea and Bathurst Correctional Centres during the Delta wave– informed broader NSW correctional setting outbreak management and an elimination strategy was adopted. With increasing cases during the subsequent Omicron waves, and in the presence of vaccine coverage, there was a shift toward a suppression approach and, later, a focus on protecting those at highest risk of severe disease (e.g. a modification of quarantine arrangements where appropriate for individuals at greatest risk).

PHRB worked closely with local PHUs to respond appropriately to outbreaks in private facilities. PHRB also sought to understand the reach of anti-viral treatments in correctional facilities.

Evolving research

PHRB, along with JHFMHN, CSNSW, St Vincent's Health Network and the Institute of Clinical Pathology and Medical Research, supported research activities in correctional settings while the Kirby Institute was engaged by St Vincent's Health Network to undertake epidemiological analysis of the outbreak in Parklea Correctional Centre (Legrand and Martinello 2022). This research provided key recommendations in relation to clinical isolation/quarantine; assessment of ventilation; surveillance testing following a confirmed case; vaccination coverage; infection control training and PPE; cleaning and disinfection processes; PPE for prisoners; and standardised case reporting to monitor the occurrence of COVID-19 and other respiratory pathogens. The findings from the study informed the management of COVID-19 in prison populations in NSW.

There are numerous examples of good practice in public health policy and action in correctional settings. For example, the Population Health Team at JHFMHN created staff and patient risk matrices for the correctional and youth justice environments to increase autonomy for managers when making risk management decisions (see Case Study 12).

Key learnings and achievements

Correctional facilities are a complex setting which require a high level of agility in policy and public health response

A strategic view of COVID-19 from PHRB/COVID Influenza Branch and LHDs, combined with an intimate understanding of the setting by CSNSW, JHFMHN and private providers, enabled agile and effective evolution of risk mitigation, pandemic response and policy in correctional settings in NSW.

The pandemic response required significant innovation in correctional settings

Staff from across JHFMHN were rapidly deployed to support the public health response. Innovative strategies used included:

- introduction of sentinel surveillance and quarantine of all new prisoners
- establishment of a COVID-19 response structure for Population Health, with designated roles and responsibilities and an escalation framework that included associated network staff (operations and clinical management)
- establishment of red and orange zones across all correctional facilities to prevent transmission and reduce the impact of staff furlough
- establishment of interagency COVID-19 response structure and communication
- development of a suite of guidelines, protocols, screening tools and policies for the management of COVID-19 in NSW correctional settings, the introduction of version control on all documents, governance through a central point, and communication with internal and external agencies
- development of a COVID-19 Risk Matrix COVID Safety Audit tool for correctional settings.

There is now a greater focus on and investment in public health in correctional settings

Modest public health functions were in place in correctional settings before the pandemic. Assessment of which functions should be maintained is worthy of consideration.

CASE STUDY 12

Staff and patient COVID-19 risk matrices and public health management for correctional and youth justice settings

Risk matrices for both staff and patients were developed by the Population Health Team at the Justice Health and Forensic Mental Health Network (JHFMHN) for the correctional and youth justice environments. The correctional-specific risk matrix was based on matrices developed by Health Protection NSW to support healthcare workers and residential aged care facilities.

The matrices distilled the key advice required to manage COVID-19 in correctional and youth justice settings, eliminating the need to consult multiple documents. Development of the matrices involved extensive consultation with JHFMHN staff, Corrective Services NSW and Youth Justice stakeholders.

Introducing these matrices resulted in a reduction in dependence on the Population Health Team for advice and increased autonomy for managers when making relevant decisions. Staff were more easily able to find information and follow processes and, as the matrices were updated each time public health orders or other advice changed, communication of such changes to stakeholders was rapid.

Feedback following the implementation of the matrices included that limiting the number of documents and using consistent clear language had a significant impact in reducing errors; risks for patients and staff were reduced as processes were clearly identified; and outbreak management and containment were more effective and efficient where JHFMHN provided services.

Continued linkages with LHDs and their PHUs will further integrate public health and ensure continuity of health interventions for high-risk populations in correctional settings. Repeated quarantine from outbreaks has impacted some prisoners accessing their usual health programs. A focus on addressing lags in preventive health and chronic disease management is required. This may be technology-enabled both during a response and as part of BAU.

The pandemic response highlighted the importance of building understanding of disease transmission and use of PPE by both CSNSW and private operator staff.

Relationships and effective communication are critical to policy development, risk assessment and outbreak response in correctional settings

Regular dialogue between PHRB, JHFMHN and CSNSW enabled challenging questions to be considered in a constructive and timely manner. Though still effective, communication between PHRB and privately operated prisons was more complex as risk assessment and outbreak response had to be coordinated with several operators and private health providers.

Finding the right balance between the welfare needs of prisoners and staff and acceptable models of isolation/quarantine is a challenge

Finding the right balance between the welfare needs of prisoners and staff was complex. Broader welfare concerns for prisoners emerged over time, as with greater than 7,000 cases from numerous outbreaks in correctional facilities as of July 2022. The pandemic also had substantial impacts on the workforce of CSNSW, JHFMHN and private providers. For example, furloughing staff came with greater pressures on those remaining. Acceptable models of isolation/quarantine are a challenge that warrant ongoing consideration with COVID-19 and future pandemics.

Recommendations

Now

4.5.1 Support finding the right balance between risk from COVID-19 and prisoner welfare and wellbeing, given that correctional settings continue to be a priority for a pandemic response and that isolation/quarantine approaches will need to be adapted in response to cases and variant characteristics.

4.5.2 Ensure systematic documentation of key learnings from the scale-up of COVID-19 public health operations in correctional settings by JHFMHN in collaboration with key stakeholders.

4.5.3 Maintain prevention and control of COVID-19 in correctional settings as a critical component of effective public health response, given that prisons are high-risk environments for COVID-19 transmission.

Future pandemics

4.5.4 Consider the broad suite of policies and processes for the prevention and control of respiratory diseases in future pandemic responses in correctional settings, including clinical isolation/quarantine, assessment of ventilation, surveillance testing, vaccination, infection control training, personal protective equipment for staff and prisoners, cleaning and disinfection processes, and case reporting systems to monitor respiratory pathogens.

References

Beaudry G, Zhong S, Whiting D et al 2020, 'Managing outbreaks of highly contagious diseases in prisons: A systematic review', *BMJ Global Health*, vol. 5, no. 11, e003201, DOI: 10.1136/bmjgh-2020-003201.

Legrand N, Martinello M 2022, *Outbreak of SARS-CoV-2 B.1.617.2 (Delta) Variant Infection Among Incarcerated Persons in Parklea Correctional Centre August - October 2021*, Kirby Institute, UNSW Sydney.

Pearce LA, Vaisey A, Keen C 2021, 'A rapid review of early guidance to prevent and control COVID-19 in custodial settings', *Health Justice*, vol. 9, no.1, pp. 27, DOI: 10.1186/s40352-021-00150-w.

Penal Reform International 2020, *Global Prison Trends 2020*, <https://cdn.penalreform.org/wp-content/uploads/2020/05/Global-Prison-Trends-2020-Penal-Reform-International-Second-Edition.pdf?fbclid=IwAR2pxeusBnt6xDR_sPhbioPvuu96TDCkd1eos1eKsFdHmq6_KC7CchvsIfA>.

5 Enablers

5.1

Governance: structures and processes to oversee and enable the NSW public health response

In times of emergency, such as the COVID-19 pandemic, effective governance matters more than ever (OECD n.d.). Governance encompasses the system by which an organisation is controlled and operates, and the mechanisms by which it, and its people, are held to account. Ethics, risk management, compliance and administration are all elements of governance (Governance Institute of Australia 2022).

Governance arrangements operative within the NSW public health response included a nexus of decision-making groups, lines of communication and reporting.* Simply put, governance refers to the 'structures and processes' in place to oversee and enable the pandemic response. These arrangements played a critical role in how the NSW public health response unfolded. Good governance continues to be crucial for the ongoing response to COVID and in strengthening our public health response to other threats.

The context

The governance structure for the NSW Health pandemic response is briefly described in Chapter 1 (*Background and context*). In summary, this comprised variably activated emergency management structures informed by emergency management plans and adopted within PHEOC/PHRB, SHEOC, the State Emergency Operations Centre, and across LHDs. Other components of the public health response governance structure included the Public Health Response Leadership Executive, HPLT, PHU Directors and LHD Chief Executives.

Incident Control Systems

The public health response and its governance articulated with a broader framework for systematic decision making that included the whole-of-health and whole-of-government arms. Central to this framework were Incident Control Systems (ICS).

ICS refers to 'a common operating framework within which people can work together effectively to manage an incident. These people may be drawn from multiple agencies that do not routinely work together. Such an operations management system uses common language and procedures that allows agencies to retain their own command structure. The key principles are management by objectives and span of control using key functions of Control, Operations, Planning and Logistics.' (NSW Government 2018)

Within the NSW public health response, the ICS structure included:

- the Chief Health Officer as the Public Health Controller
- senior public health physicians within PHEOC/PHRB as Deputy Controllers
- the Public Health Response Leadership Executive within the Ministry of Health.

These key decision makers met throughout the pandemic, and with PHRB team heads and senior medical advisers to consider emerging data, evolving risks, and appropriate strategic and operational responses. Through various mechanisms, including the HPLT, SHEOC, COVID-19 Program Management Office and others, these strategic and operational shifts would be conveyed to and coordinated with other parts of the response, and with other critical decision-making entities.

Concurrently, LHDs established local emergency management structures at various timepoints according to need as initial outbreaks occurred and in line with minimum standards for public health preparedness (NSW Health 2019). The objectives were to establish clear leadership, deliver timely and coordinated responses that focused on local priorities as COVID-19 spread, and to draw in necessary resources to respond to and mitigate risk.

NSW public health network and Health Protection Leadership Team

NSW Health has a longstanding networked model for public health, including 12 PHUs located in LHDs along with participation of some specialty health networks such as JHFMHN. This networked model provided many advantages for the NSW COVID-19 response, including capacity for simultaneous surge staffing at both local PHU and NSW public health response levels; pre-existing decentralised public health expertise; and in terms of governance, a pathway for lines of communication, consultation and decision making as the response evolved.

A component of the public health governance structure was the HPLT – chaired by the Deputy Controller or Chief Health Officer and including PHU Directors, PHRB Executive and senior managers – who met sometimes more than daily at peak activity times. Having those existing structures and relationships was crucial.

* Note on nomenclature

Public Health Response Leadership Executive – Chief Health Officer (Public Health Controller), Deputy Chief Health Officer, Deputy Public Health Controllers
Public health response – local and statewide responses
Local public health response – public health units, local health districts
NSW public health response – Public Health Emergency Operations Centre/Public Health Response Branch/ COVID Influenza Branch (depending on timeframe)
Central agency – Department of Premier and Cabinet, Treasury, Department of Customer Service

State Health Emergency Operations Centre

The SHEOC was set up in March 2020 to oversee the NSW Health operational response to the COVID-19 pandemic. The initial remit of the SHEOC was to enact, operationalise and implement public health orders, assist LHDs and specialty health networks to build critical care and emergency department capacity, establish COVID-19 testing clinics, and coordinate the supply of PPE. As the COVID-19 pandemic progressed, the SHEOC evolved substantially to operationalise the NSW response. In 2021, the focus of the SHEOC expanded to include the rollout of the NSW COVID-19 vaccination program, while maintaining other critical areas of business such as testing clinics, the hotel quarantine and exemptions program, airport and maritime operations, aged care planning, ICU and ventilator preparedness, logistics and supply chain delivery, and internal and external communications (NSW Health 2022).

From a governance perspective, tight liaison was essential between SHEOC, as a critical operational lynchpin, and the Chief Health Officer, other Public Health Response Leadership Executive, and the COVID-19 Program Management Office.

COVID-19 Program Management Office

The COVID-19 Program Management Office was established in the Office of the Secretary in 2020 to:

- provide transparency on what was happening across NSW Health to support the COVID-19 response
- create clarity on key decisions
- report on key activities and drive the pace of work.

It gave the Incident Controller clear Executive oversight, identified risks, and provided a means to monitor complex and cross-cutting workstreams. During the Delta wave in 2021, it became the Delta Coordination Team and provided secretariat function and coordination of the Delta Micro Strategy. This strategy required collaboration across government to respond to the complex and evolving situation, first in the LGAs of concern, and then across NSW.

Broader governance environment

Though not within the terms of reference of this debrief, it is important to recognise that there were several additional layers of governance for the NSW public health response at both state and national levels, highlighting the complexity in governance of the pandemic response. On a state level these included the NSW Minister for Health, NSW Government Cabinet and Crisis Cabinet. Nationally, governance structures included the Australian Health Protection Principal Committee, CDNA, Public Health Laboratory Network and National Cabinet.

The Australian Health Protection Principal Committee is the key national decision-making committee for health emergencies. It is comprised of all state and territory Chief Health Officers and is chaired by the Australian Chief Medical Officer. The CDNA provides national public health coordination and leadership, particularly technical advice around disease surveillance, prevention and control. It consists of government representatives (state, territory, federal and New Zealand) and representatives from relevant academic and non-government organisations. National Cabinet is a forum for the Prime Minister, Premiers and Chief Ministers to meet and work collaboratively. The creation of National Cabinet on 13 March 2020 was precipitated by the response to COVID-19 and its role continues to evolve, from a health and crisis management focus, to one of driving Australia's economic recovery and jobs creation.

Key learnings and achievements

The Incident Control System provided a governance and operational framework for the public health response, but could be tailored for such a large scale and prolonged pandemic

NSW had just emerged from the bushfire disaster of 2019 when COVID-19 hit Australia. Police, emergency services and government had called on established emergency management structures to manage that disaster. However, the COVID-19 public health and health system response appeared to mount, over time, a hybrid model of ICS and BAU practices, in part from a need to maintain commitment to sustaining broader functions within the health system that intersected with the response.

Respondents noted that there were sometimes blurred lines of decision authority across agencies and sectors as the response rapidly expanded. Respondents also noted that success in operational activity was often achieved even with sometimes unclear lines of 'command and control', and that this was largely down to positive team environments and personnel supporting each other.

Workforce management became challenging within the ICS structure. It was not always apparent to respondents how to circumvent bottlenecks to maintain timely decision approvals related to competing demands on key decision leaders.

A key objective of the ICS structure is not just to make clear the roles of participating agencies and individuals, but also to identify where resources need to be brought into the response in a timely way.

Many respondents queried whether an ICS structure is too unwieldy for a public health emergency response of this scale, breadth and duration. There was support for the ICS structure being reviewed or tailored for such conditions in future responses.

Respondents also suggested that the emergency management structure was not well understood by many participating surge personnel. Under BAU conditions, public health staff are required to undertake training in *Public Health Emergency Response Preparedness Minimum Standards*, and this needs to continue at scale during a pandemic response (NSW Health 2019).

The scale of the pandemic required constant changes in people, process and response structure

Respondents observed that the NSW public health response had to change its operating model rapidly – including people, process, technology and structure – given the complexity and speed of the changes that bore down in the response. However, many respondents felt that communication regarding the rationale for changes to processes and structures was not always delivered clearly or understood. In future pandemics, it should be anticipated that there will be a need to pivot processes, structures and governance in response to changing context.

A more agile use of workforce and functional organisational structure to address a sustained and evolving response should be considered. This will assist in creating a flexible and supported workplace.

Managing the volume of information flows across NSW Health (SHEOC, public health response, LHDs) and the NSW Government, as well as laterally with other state and national agencies, was challenging

Constant flow of information up and down management levels within the NSW Health and public health emergency responses, within LHDs, as well as laterally with other state and national agencies and governance bodies, was challenging and generated a significant workload.

In a rapidly evolving response, ambiguities in lines of communication sometimes emerged. A strong internal communication focus should be embedded in the response. A variety of mechanisms were used and some key learnings to improve internal communication included:

- use frequent and regular briefings at various levels of internal stakeholders
- briefings offer the opportunity to flag upcoming changes and their potential impact, achieve operational alignment, and identify need for alerts to wider stakeholder groups
- briefings should be both operational and strategic in focus
- use of regular webinars for staff should be used to support internal communications (e.g. public health units found these a useful communication adjunct)
- key position holders need to be clear on their internal communication responsibilities.

Embedding systems for strategic issue tracking, prioritisation and escalation where required across NSW Health governance structures is important

The speed of decision making and need for synchronicity across multiple levels of governance during the response was understandably challenging. There was often little time available between an order or shift in policy at a state or national level and its local implementation. LHD respondents identified the need for clearer escalation pathways for PHUs seeking clarity on matters of statewide policy or process in a timelier manner.

Though there were action logs and risk registers used within some governance structures in the public health response, some felt that there was not always a clear escalation pathway when an issue was not resolved. Given this, there is a strong case for systematic processes for decision making, tracking, prioritisation and escalation of outstanding strategic issues that are visible to decision makers across governance structures.

This did occur at various levels in the public health response, but some respondents suggested a central risk register or similar might have been helpful as an escalation mechanism.

Prioritising and enhancing strategic planning capabilities in the public health response is merited

It is widely acknowledged that PHEOC/PHRB and Executive were working in an extremely complex and challenging environment. The importance of focusing on the 'now', but equally having a strategic focus, was identified by respondents as essential. A number of strategies were identified to support effective strategic planning.

1. Build an enhanced strategic planning capability, under BAU conditions, that will increase capacity for response planning, coordination, strategy and policy.
2. Create tighter links between operational metrics, predictive modelling and surge resource planning to inform workforce recruitment and prioritisation.
3. Undertake regular future scenario planning and exercises across the health system and government.
4. Draw on academic partners to support this work, including modellers, virologists and vaccine specialists.
5. Support multidisciplinary input.

Boosting capability and support at senior leadership levels is needed to manage staff welfare, fatigue and key person risk

Boosting capability at senior leadership levels is important. Having a flexible approach to drawing in and rotating suitably qualified senior staff to deputise in critical areas of the response will enhance strategic capability and reduce fatigue and key person risk during future pandemics. This capability should be built during BAU and is further discussed in Chapter 5.2 (*Workforce capability and surge capacity*).

Medical advisers effectively led strategic initiatives

Respondents indicated the inclusion of medical advisers in the public health response, such as Deputy Controllers – and to lead strategic initiatives – was highly beneficial noting it is important that their role, functions and reporting lines need to be clear.

Communicating strategic priorities to the network throughout the response was important to maintain a common sense of purpose

Strategic and policy planning is challenging in an environment of high velocity change. Reactiveness to the problems of the day was unavoidable, especially at times of peak activity. Many parts of the response experienced significant swings in changing priorities, often multiple times a day. Many respondents felt that more effective dissemination of information about shifting organisational objectives and 'strategic and operational resets' at various phases of the response would have been helpful in informing surge planning and operational management.

Respondents identified a need within LHDs and for regional partners for greater understanding about how different priority groups were being managed, including by other departments and agencies. This brought challenges for their local engagement, for example with schools. A form of 'governance mapping' on critical issues and relevant stakeholders was suggested as a means of enhancing transparency for LHDs on evolving changes. Furthermore, to achieve more alignment HPLT might have benefited from summary information about what critical information was being provided to other services and Chief Executives.

Despite the challenges, there were numerous efforts to communicate with the broader public health network using whole-of-network webinars, policy-based meetings, and other fora. These communication vehicles should be used more frequently as a means of communicating strategic intent, in addition to governance structures, in future pandemics.

Experienced operational managers and clear line management improve the public health response

The culture within PHEOC/PHRB and PHUs was one of collaboration, adaptability and willingness to work hard.

Managers with varying degrees of experience were brought in or raised up as the response expanded, often at the most stressful peak periods. All brought their utmost to the response.

Respondents reflected that targeted recruitment of professional managers experienced in managing call centres or large operational teams would have been desirable in order to build teams and monitor and support staff wellbeing under pressured conditions. However, respondents noted that even very experienced managers would be challenged to rapidly get across substantial technical operations under such conditions.

The need for establishing clear line management (e.g. agreed lines for routine reporting), oversight of personnel and escalation of concerns were also identified as issues that merit consideration in future pandemics.

The Health Protection Leadership Team was a critical forum for strategic and operational planning and implementation

Having a distributed public health network comprising the NSW public health response and PHUs (with their pre-existing relationships) was a clear advantage for the NSW public health response. HPLT was a critical forum for strategy, information exchange, operational planning and implementation but it sometimes had to grapple with balancing local priorities and forging consistency in practice across the state. Standardisation of processes and tools and their dissemination to the public health network is a critical enabler of effective public health response.

Respondents varied in how they understood HPLT's role during the response. Some respondents also questioned whether this forum was always used in the most strategic or efficient way. Meetings were daily and sometimes more frequently at peak activity times and, given multiple demands on overloaded members in an extremely busy environment, best use of experts' time was a legitimate concern.

The roles and responsibilities of HPLT going forward should be reviewed, noting that HPLT may assume different functions depending on the nature of issues being considered. Papers for HPLT should clearly identify the purpose and intent of what is sought from HPLT, such as endorsement of policy or procedures, provision of advice, or that a paper is for information/noting.

Coordinating efforts with LHD Chief Executives is vital to effective response

Clear, consistent and regular engagement by public health teams with LHD Chief Executives was considered vital to giving them a better 'line of sight' and supporting their decision making and effective action in the complex ecosystem of the response.

Respondents noted that PHU Directors had variable mechanisms and triggers for reporting to and liaising with their LHD Chief Executives. Some noted that the absence of clear public health operational metrics (e.g. for case interviews, contact tracing etc) and associated human resource requirements early in the pandemic made it more challenging to build a case for additional resources with Chief Executives. Consideration for developing a common performance framework for HPNSW, including consistent operational and performance metrics for future pandemics, is merited.

Some PHUs also reported experiencing pressure to find local solutions to emerging problems that were also being addressed by the NSW public health response, resulting in some replication of effort (e.g. providing welfare support packages).

Greater role clarity on policy and operations was sometimes required between SHEOC, PHRB and the Clinical Excellence Commission

Aiming for streamlined decision making and reporting between SHEOC, PHRB, other agencies generating policy, and the response Executive is a key factor for good governance and effective operations.

Intersection issues and competing objectives will inevitably arise in fast-paced, evolving environments with great change. Respondents talked about the importance of 'staying in your lane'. Clear escalation and communication processes need to be agreed and accessed by staff where such tensions arise and are unable to be resolved.

Early standardisation of processes and tools is important to effective public health response

In a devolved structure, variability across PHUs in routine practices and approaches is inevitable. However, this became a problem in the response with PHUs needing to substantially modify resources locally.

Respondents indicated that earlier prioritisation of developing standardised processes and tools, for example related to cases and contacts, would have forged clearer and more efficient practices across the network. This might have included developing agreed metrics about how many case interviews should be performed in given timeframes, interview templates, and standards for conducting interviews. Respondent feedback suggests that there is now greater recognition across the network of the importance of statewide standardisation of documents and processes in this context. Such standardisation was achieved over time. Unless variation is required in areas dependent on local knowledge, standardisation should be a shared system principle going into the next response.

A culture of consensus-based decision making in public heath is a strength, but was at times a challenge under emergency conditions

Consensus-based decision making is part of the culture within public health and is routine practice. However, emergency responses require a shift to command and control decision making. This shift occurred over time as practices were standardised across the public health network.

Intra/after-action review processes are an important quality improvement and reflective tool and should be part of routine public health practice

An intra-action review (IAR) is a process that reviews response actions to identify crucial gaps and optimise response plans for an ongoing public health response. An after-action review (AAR) provides a means to observe how well preparedness systems perform in real-world conditions after the response and can help to identify and improve public health emergency preparedness and response. AARs also provide an important opportunity to debrief on the psychological and emotional impacts of working in high-stress events and should be promoted as one means to support staff wellbeing, as well as a strategy to improve governance. The experience of undertaking an AAR as part of the debrief was described by the vast majority of Ministry and LHD participants as a critical opportunity to collectively reflect, surface problems and discuss solutions in a structured way for future practice improvements. Debriefs were conducted during this response but a more structured approach with regular and routine IAR/AAR would be of benefit.

Recommendations

Now

5.1.1 Review and update the NSW Public Health Incident Control System, minimum standards for public health preparedness and associated training to incorporate key learnings from the COVID-19 pandemic.

5.1.2 Review the organisational structure of HPNSW to effectively integrate emergency response functions into BAU and include consideration of reporting lines, operational metrics, surge capacity and governance, with the flexibility to respond to future public health emergencies.

5.1.3 Undertake ongoing development of Health Protection performance and standards that takes account of organisational requirements, leverages existing formal and informal metrics for identifying risk and optimising system performance, and complements concurrent efforts aimed at enhancing corporate governance and relationships with key partners, such as LHDs. This process should inform operations under both BAU and emergency conditions.

5.1.4 Enhance executive-level strategic planning capability within HPNSW for response planning and coordination, and related organisational change.

5.1.5 Review the terms of reference of HPLT, given key lessons learned from the pandemic, and delineate roles and responsibilities, noting HPLT may serve different functions depending on the nature of issues being considered.

5.1.6 Maintain and build on relationships that have been built during the pandemic both centrally and locally, including with central agencies, clinical networks, primary health networks, the education sector, Multicultural NSW and NGOs.

5.1.7 Embed use of intra/after-action reviews as part of routine public health practice across the network as a mechanism for practice improvement, future pandemic and emergency processes planning, and/or as a vehicle for personnel debriefing on challenging events.

5.1.8 Develop an implementation plan arising from this debrief report in consultation with relevant implementation stakeholders.

Future pandemics

5.1.9 Consider mechanisms for timely and appropriate briefing of the broader public health network on major changes in the response strategy, including online town hall events throughout the pandemic.

5.1.10 Embed advisers or senior public health managers in SHEOC to assist decision making and translation of public health orders into operational planning and coordination, and to link back to public health.

References

Carlson V, Chilton MJ, Corso LC et al 2015, 'Defining the Functions of Public Health Governance', *Am J Public Health*, vol. 105, no. S2, pp. S159-S166, DOI: 10.2105/AJPH.2014.302198.

Governance Institute of Australia 2022, *What is governance website*, Governance Institute of Australia, accessed 22 August 2022, <www.governanceinstitute.com.au/resources/what-is-governance/>.

NSW Government 2018, *New South Wales State Emergency Management Plan*, NSW Government, Sydney, <www.nsw.gov.au/sites/default/files/2021-04/state-emergency-management-plan-emplan.pdf>.

NSW Health 2019, *PD2019_007 Public Health Emergency Response Preparedness Minimum Standards*, <https://www1.health.nsw.gov.au/pds/Pages/doc.aspx?dn=PD2019_007>.

NSW Health 2022, *State Health Emergency Operations Centre (SHEOC) Achievements Report 2021*, NSW Ministry of Health, Sydney.

Organisation for Economic Co-operation and Development (OECD) n.d., *Responding to COVID-19: The rules of good governance apply now more than ever*, accessed 22 August 2022, <www.oecd.org/governance/public-governance-responses-to-covid19/>.

Yang K, Qi H 2022, 'The Public Health Governance of the COVID-19 Pandemic: A Bibliometric Analysis', *Healthcare*, vol. 10, no. 2, pp. 299, DOI:10.3390/healthcare10020299.

5.2

Workforce capability and surge capacity

A capable multidisciplinary workforce is essential to mounting an effective public health response. A public health workforce includes professionals and other workers who engage in efforts to keep people healthy and prevent injury, illness and premature death. This workforce requires a range of capabilities, including public health, medicine, epidemiology, communications, community engagement and operational management. Many personnel who were not from these professional backgrounds were drawn from areas of government, universities, the ADF and the wider community to support the response. Thousands of personnel participated in the NSW public health response.

The context

Rapid establishment of recruitment, rostering and human resources functions

On 21 January 2020, the PHEOC was established to coordinate NSW Health's COVID-19 response. In a matter of weeks, the PHEOC was operating seven days a week over two shifts a day. At the same time, similar seven day a week staffing requirements emerged in a number of LHDs. This required a rapid scale-up of staffing, recruitment and workplace systems to support the public health response.

It immediately became clear that BAU recruitment and onboarding processes were unable to meet the staffing demand of the PHEOC in a timely fashion. As a result, CEE was tasked with creating a multidisciplinary team made up of Ministry and Health System Support Group human resources teams, public health training program administrators, finance and IT staff who met daily to manage:

- recruitment
- mass onboarding agreements
- rostering and timesheet management
- award interpretation
- staff wellbeing
- capacity planning
- finance
- onboarding, orientation and offboarding staff
- workforce reporting.

In the initial weeks of the PHEOC, NSW Population Health Training Program (Public Health, Biostatistics and Aboriginal Population Health training programs) trainees and alumni, along with Population and Public Health Division staff were critical in the surge, making up the majority of PHEOC staff (see Case Study 13).

Surge requires engagement across NSW Health corporate functions

It became clear early in the pandemic that an effective public health response required not only public health and epidemiological expertise, but also a multidisciplinary workforce skilled in law, policy writing, communications, community engagement, clinical operations and inter-government relations.

The rapidly evolving situation required support, professional input and engagement from internal units across NSW Health, both centrally and locally. The workforce surge required engagement across NSW Health corporate functions, including human resources (recruitment, award interpretation, mass agreements); information technology (laptops, quick turnaround for facility access, system access); facilities (room bookings, building/after-hours access, car parking); finance (establishing extraordinary processes and budget requests); and payroll (creating staff profiles to enable onboarding).

Key surge mechanisms used within the Ministry-led public health response included:

- redeployment of Population and Public Health Division staff
- redeployment of other Ministry staff
- targeted recruitment (public health alumni)
- Ministry expression of interest (formal redeployment)
- expression of interest of Master of Public Health students from NSW-based universities
- NSW Health external expression of interest
- additional NSW Public Health Training Program trainee recruitment
- development of mass onboarding agreements with key academic, government and non-government partners (University of Sydney, University of NSW, Sax Institute, The George Institute, Australian Commission on Safety and Quality in Health Care, NCIRS, Department of Primary Industries, ADF, Qantas and Public Service Commission).

To illustrate the scale of these efforts, by December 2020 there were 655 people employed in the public health emergency response across PHEOC teams, central contact tracing functions and SHEOC, and by October 2021 this had reached 1,000. To put this in context, in October 2021, this exceeded the number of staff employed in all roles by the Ministry over the same period.

In LHDs, key workforce surge strategies included redeployment of health promotion staff, particularly in the initial phases of the pandemic, and other health staff as the response progressed.

CASE STUDY 13
Contribution of NSW training programs to the NSW public health response workforce

NSW Health has well-established population health training programs. Three training programs made significant contributions to the COVID-19 public health response: the Public Health Training Program, Biostatistics Training Program and the Aboriginal Population Health Training Initiative. Each of these three-year workplace-based training programs provide supervised learning across a range of population and public health settings. Trainees develop public health competencies while contributing to the strategic and operational priorities of NSW Health.

A core function of the Public Health and Biostatistics Training Programs is to provide surge capacity for NSW Health. Trainees can be rapidly deployed to support issues of public health importance. At the start of the pandemic, trainees represented 28% of staff in the statewide public health response. Over the course of the pandemic, 73 trainees were deployed to the response. This included:

- 60 Public Health and Biostatistics Trainees who supported statewide operations, policy and borders, venue management, epidemiology and surveillance, adverse events following immunisation, logistics and central contact tracing
- 13 Aboriginal Population Health Trainees who supported local health district responses in venue management, contact tracing, supporting Aboriginal-identified cases and contacts, participating in vaccination clinics in Aboriginal communities and consulting with community.

Trainees brought a range of public health skills and experience to the response and were able to be deployed quickly, with minimal onboarding. They were highly valued for their expertise and enthusiasm. The diversity of skills gained through work placements and professional experiences were aligned with the wide range of skill needs across the response.

The training programs also supported leadership capacity within the response. More than 60 program alumni participated in the response in senior roles, including the Chief Health Officer, Deputy Chief Health Officer, and Public Health Controllers.

In addition to supporting the workforce needs of the COVID-19 pandemic, the experience of working in the response enabled trainees to develop and strengthen capability in areas such as epidemiology, surveillance, outbreak management, rapid policy development, and management and leadership. Their involvement represents a significant investment in future leadership capacity for NSW Health and preparedness for public health emergencies.

LHDs conducted recruitment processes to expand their public health workforce and surged using innovative methods, including using medical students in some LHDs. ADF personnel were deployed to supplement local staff in South Western Sydney LHD, Western Sydney LHD, and the central contact tracing and case interview teams during the Delta wave. Training for new staff was commonly provided using buddy systems. In many LHDs training materials and 'cheat sheets' were created to support staff training. As LHD-based public health response workforces surged it was necessary to add additional layers of team leaders and managers. This additional layer of management expertise was vital to effective local response.

Many LHDs reported the value of employing multilingual staff who could communicate effectively with CALD populations. A key challenge in the initial phase of the pandemic was resourcing this expansion of the workforce, but this was largely addressed by allocation of additional funding during the Delta wave. However, the ongoing resourcing of the public health workforce became a concern as the pandemic progressed, particularly for PHUs.

In September 2020 recruitment, human resource and surge functions transitioned to the Pandemic Response Co-ordination Team of the newly created PHRB. Taking the lessons learned in the first phase of the pandemic, LHDs and PHRB successfully surged the public health workforce in subsequent COVID-19 outbreaks across 2020–2022.

There was exponential growth in the PHRB workforce in 2021 as the Delta wave saw the Branch needing to grow to twice the size of its 2020 operations. A range of surge strategies were used, including recruitment across pillar agencies, current and former Ministry staff, and LHDs. Of note, 50% of the surge workforce was drawn from across NSW Health. The ADF were significant contributors to the PHRB surge workforce, among many other roles they provided across the NSW Health COVID-19 response. The CCTT was called on at various timepoints as an internal pool for surging staffing across PHRB, given its size and the role flexibility CCTT staff had acquired over time.

PHRB staffing peaked during the Delta wave in September 2021 with a total count of 1,871 FTE workers, 50% of which were part of the CCTT. The FTE count remained high during the Omicron wave of December 2021–January 2022, with 985 working in PHRB, of which about one-third were in the CCTT. There was a steady decrease in FTE staff in PHRB and LHDs from March 2022 as COVID-19 transitioned towards a future endemic state in the NSW population. In April 2022, PHRB became the COVID Influenza Branch within HPNSW in response to the resurgence of other respiratory illnesses and the need to have a common approach in response to viral respiratory illness in the community, including influenza and respiratory syncytial virus infection.

There were numerous examples of rapid surge of staff and formation of teams both centrally and locally to perform various response functions, including contact tracing (see Case Study 3 in Chapter 3.1), operations, call centres and venue risk assessment (see Case Study 14).

It is important to recognise that repeated surges and a rapidly evolving pandemic response presented significant workforce challenges. Providing the workforce required at the right time with the right skills was a challenge and meant that for several periods of the pandemic unsustainable workloads emerged. At times of surge this increased pressure on staff resulted in high levels of workforce stress. NSW Health's various employee assistance programs were promoted during the pandemic in the Ministry and LHDs to assist staff to manage workplace stress.

Additionally, the PHEOC/PHRB worked closely with Ministry and Health System Support Group human resources teams to secure the services of counsellors to walk the floor and provide free and confidential counselling and advice to response staff at times of surge. Apps and other resources were also promoted by PHRB leadership.

Key learnings and achievements

The ability to surge the public health workforce both centrally and locally over successive waves of COVID-19 represents a substantial achievement for NSW Health

Though challenging, surging the public health workforce so dramatically both centrally and locally over successive waves was a considerable achievement. The response gave thousands of new and recent public health graduates real-world experience in public health. Many respondents noted that it was particularly gratifying to see the enthusiasm applied by young staff entering the public health workforce, and the dedication of older staff, some of whom came out of retirement to play a part in responding to the pandemic.

A multidisciplinary and culturally diverse workforce is critical to effective public health response

An effective public health response requires a robust multidisciplinary workforce with a range of capabilities, including public health, medicine, epidemiology, law, communications, community engagement and operational management. This workforce must have the capability to effectively engage with the community, health system, and across government agencies. Strong representation of CALD and Aboriginal people at all workforce levels is essential to ensuring a culturally competent and diverse workforce.

Training programs and associated alumni were an important surge workforce and were critical to the success of the response

NSW Health's long-term investment in population health training programs bore fruit during the pandemic with trainees and trainee alumni critical to the success of the initial workforce surge. Furthermore, many trainees assumed management and leadership roles across the public health response.

CASE STUDY 14
Rapid establishment of the Venue Management Team in PHRB

The Venue Management Team (VMT) was established in mid-July 2021 to provide public health advice and risk assessment support to a range of venues where a person with COVID-19 had attended. These included construction sites, supermarkets and food manufacturers. The team was established in response to public health units requesting assistance from the Public Health Response Branch (PHRB).

VMT was initially set up rapidly for a two-week period to work through venues requiring assistance, a large proportion of which were construction sites. PHRB assembled a team of 14 staff from Health Infrastructure NSW (including an Executive Director, PSSE Band 2) and the Department of Planning and Environment to work alongside PHRB public health experts and provide the mix of expertise required to assess and assist those venues.

Splintering out high-volume tasks from the core Operations Team into separate teams (the extended Ops concept) enabled expedited scaling up through rapidly engaging and training skilled people in discrete sets of tasks, without them having to be trained in public health. Having public health experts within VMT to provide oversight and advice was crucial. The core Ops Team retained liaison with public health units and venue management for some essential services. Public health units also continued to manage higher-risk venues within their capacity constraints.

As case numbers continued to increase, it became clear that VMT played a critical ongoing role. The workforce strategy adjusted accordingly, sourcing staff for a longer term through existing and new arrangements from other areas of NSW Health (including a Director, HSSE Band 1), other government agencies, recruitment agencies, and other organisations, including universities and research institutes. The team grew to 160 full-time equivalent employees by September 2021. More robust systems and processes for managing the workload and allocation of venues across the public health network were also developed at this time. The inclusion of an occupational physician in the team was essential.

VMT was wound up in mid-February 2022 with functions returning to public health units and PHRB core Ops. During its time in operation, VMT worked in collaboration across public health units and core Ops to directly assist more than 16,000 venues and developed a range of tools to assist businesses in self-managing COVID-19 prevention and control.

Many training program alumni were employed in LHDs prior to the pandemic and assumed management and leadership roles during the pandemic across the public health network.

Workforce structures need to rapidly adapt to the evolving context

There were several restructures of the response – starting with the creation of PHRB and more recently the COVID Influenza Branch – to align the response structure more closely with business requirements. The re-emergence of influenza and respiratory syncytial virus in the community in 2022, in addition to COVID-19, has highlighted the importance of responding to respiratory infectious diseases in an integrated fashion. There is a need to integrate the response into BAU requiring closer integration of the COVID-19 response with HPNSW is required.

Rapid training of the surge workforce is critical to effective public health response

With such a diverse workforce being deployed into the public health response, training on the roles and responsibilities associated with different functional areas of the response was necessary, particularly during periods of surge when less time could be spent on staff orientation. Several training packages were developed on contact tracing, case and contact management, venue risk assessment and NCIMS. Respondents identified that having more centralised training resources would have circumvented the need for PHUs to develop their own resources, avoiding replication of effort.

It was also important to train staff on ways of working and interacting with colleagues consistent with the NSW Health CORE (Collaboration Openness Respect Empowerment) values.

Normalising expectations for participation in future pandemic responses will assist surge planning and deployment

Repeated surges over second and third waves, often at short notice, encountered many barriers, including that some services were reluctant to release previously available personnel, given competing BAU demands. Some staff did not consider participating in the emergency response to be part of their role and this mismatch in expectations was a source of stress for some.

Respondents indicated that a whole-of-health system workforce approach is necessary in responding to a pandemic. It was recognised there will be challenges in maintaining health professionals' engagement with public health and pandemic preparedness for future pandemics over coming years. Normalising the expectations of health professionals and broader NSW Health staff for participation in future pandemic responses is important, as is participation in surge planning and maintaining capability to rapidly upskill staff in emergency management. It may also warrant investigation of including pandemic preparedness in clinical and hospital accreditation processes and related mandatory minimum training. Importantly, there was agreement that stronger and more prepared BAU practices and standards will lead to more effective and efficient future pandemic responses.

The complexity of award structures made deployment and rostering of response staff challenging both centrally and locally

A substantial challenge across the pandemic was rostering, given the workforce participating in the response both centrally and locally were employed under vastly different awards and conditions. To illustrate, staff working in PHRB were employed under NSW public service Crown awards (executive and non-executive); various health service awards, including nursing, medical officer, environmental health officer, health education officer, allied health and health service managers and Aboriginal health worker; numerous university enterprise agreements; and a myriad of other public sector awards.

In clinical settings, award requirements are built into rostering systems. This is a straightforward process when dealing with a limited number of well-defined award classifications.

To simplify employment engagement and rostering later in the pandemic, many people participating in the response centrally were employed as contingent workers under consistent shift worker conditions. Having consistent and appropriate role descriptions and industrial instruments that include shift work provisions to employ public health surge staff centrally and locally would be an important enabler of effective surge in future pandemics.

Recommendations from the NSW public health response AAR were that consideration should be given to creating a new public health award and a credentialing pathway for non-medical public health professionals. These recommendations stem from a desire for greater recognition of the vital role non-medical public health practitioners play in the public health response across NSW and the importance of their ongoing career development. Having a single public health award was also thought by AAR participants to offer a potential solution to reduce award complexity in future pandemic responses, but such an approach would not be without implications. How best to streamline the modes of engagement of response staff both within the Ministry and in LHDs during pandemic responses, and associated pros and cons of different scenarios, merits further consideration.

Ensuring sustainable working practices across central and local response structures is critical

Feedback received through the debrief process in NSW highlighted that the extent and duration of the COVID-19 pandemic response in NSW resulted in significant levels of fatigue for staff, particularly for those in roles subject to key person risk. An organisation has key person risk when it is highly reliant on one individual or individuals.

Boosting capability at senior leadership levels through a flexible approach to drawing in and rotating suitably qualified senior staff to deputise in critical areas of the response will enhance oversight, strategic, policy and other capabilities and reduce fatigue and key person risk during future pandemics.

Similar pressure was experienced by public health leadership in LHDs, where it is rare to have deputies, and additional layers of temporary support similarly would improve the effectiveness and sustainability of the local public health response.

Key position leaders, and those in key specialist technical or data roles both centrally and locally, should have clearly identified delegates and structured downtime.

Measures to support staff welfare must be a priority throughout the response and implemented early

The transition towards an endemic state of COVID-19, scale down of public health operations after several surges, and repeated furloughing has resulted in a depleted and tired public health workforce. This is consistent with findings from healthcare professionals and public health workers in other Australian jurisdictions and internationally (Duckett et al. 2022). Many respondents talked about how they struggled with managing the anxiety of a 'we cannot fail' mentality. An 'all hands on deck' approach was required to meet the demands of the situation, but a balance must be struck between effective response, sustainable work practices and staff welfare. In addition, respondents identified training in mental first aid and dealing with complex and difficult customers as important potential tools to build staff skills and resilience.

Measures to support welfare of staff and maintain sustainable work practices should be implemented early and become usual business practice throughout public health responses.

Centralised recruitment and onboarding facilitated rapid surge

Recruitment of staff to work in different functional areas of the NSW public health response was challenging both centrally and locally. An important learning was that staff working in the response were often too time-poor to identify and select viable candidates, so mass onboarding with centralised recruitment processes was required.

Importantly, the existence of a statewide public health network enabled statewide as well as simultaneous local workforce surge, adding to the ability of the NSW public health response to simultaneously flex at state and local levels.

Respondents noted that there is merit in PHUs and HPNSW identifying in advance the diverse skills and capabilities of staff within their teams so that these can be promptly promoted and used during surge conditions.

This is consistent with good management practice and would also inform training needs locally.

Accurately determining workforce deployment across the response both centrally and locally was challenging

A challenge identified throughout the response by surge teams was the lack of a joined-up view of the number of people working in the public health and health system responses, including in LHDs, particularly at times of surge. As there are different human resource management systems deployed across NSW Health, getting accurate and timely information from existing systems was not possible and emergency response teams needed to maintain their own systems, generally using Excel spreadsheets. An integrated human resource management system would have facilitated more efficient human resource allocation during the response, both centrally and locally.

Long-term relationships with academic partners and non-government organisations were effectively leveraged for workforce surge and could be expanded for future pandemics

Longstanding funding arrangements, relationships and partnerships with the academic and non-government sectors were rapidly leveraged in the form of mass onboarding agreements to great effect across the pandemic on a state level. These relationships were used to a lesser extent locally and could be expanded in future pandemics.

The medical adviser workforce was an important enabler of flexible and effective public health response, especially in its intersection with clinical systems

Having a large pool of medical advisers as part of the Population and Public Health Division prior to the pandemic was an important enabler of the public health response. Public health physicians have unique skills and their training combines experience in clinical medicine with specialist fields relevant to the health of populations, meaning they could be flexibly

deployed throughout the response to lead policy and public health action while simultaneously providing clinical advice.

This workforce was particularly important in managing interactions between public health and the clinical system and was critical to the provision of risk assessments and public health advice across NSW Health services, and the briefing of clinical groups.

The response would have benefited from additional operational and system management expertise

The debrief identified a number of important skills gaps in the response, including senior executives with operational and system management experience. Operations is a specialist field aimed at organising a service to optimally utilise its resources, with the end goal of creating efficiency. Operations management focuses on analysing and improving business processes and practices. These principles were partially deployed in the response, but they could have been given greater legitimacy and applied more broadly across PHRB teams. Though medical qualifications were required for certain executive functions such as signing public health orders and provision of medical advice underpinning response strategy, these skills were not required for senior operational strategy, planning and logistics roles in the response. Greater use of operational managers assisted the medical workforce with more sustainable workloads.

Experience and capability in working across government was also identified as an important skill.

Integration of human resource and operational functions at Executive level within the organisational structure of the NSW public health response would have strengthened the response

A more strategic approach to the distribution of staff that included systematic matching of skills and response need during periods of significant surge would have been beneficial. A key learning from this was that a dedicated business support unit that includes finance, planning and human resources functions should be integrated into the organisational structure of the public health response. This function should sit in the Executive structure to ensure that recruitment and business systems meet both strategic and operational needs of the response. It would also ensure that the Business Support Executive has a better understanding of the strategic goal being pursued at different stages of the pandemic.

Respondents reported that better communicating the overall strategic goal at each stage of the response would have assisted in providing a rationale for moving away from low value activities and redeployment of resources to more strategic priorities. Town hall meetings, webinars and other fora should be used more extensively to communicate change to response staff.

Mathematical modelling for COVID-19 is useful and could be used alongside other considerations as a workforce planning tool

There needed to be a better connection with modelling, namely predictions of cases and operational decision making relating to workforce surge in PHRB. Case modelling – alongside consideration of factors such as TTIQ capabilities and prevailing context – can be used as a workforce planning tool, both centrally and locally.

Workforce preparedness planning should consider a model for staged scale-up of response operations

A ‘concentric rings’ model for thinking about how to plan for workforce preparedness was identified by respondents as a potential framework for future pandemics. Under this model, the inner ring is standing public health capacity of a highly skilled multidisciplinary public health workforce, the next ring is staff with public health training but less system experience and other health staff, and the outer ring brings in less skilled and experienced staff and requires ‘just in time’ training. The scale of the pandemic response needed to call on all rings. Workforce planning needs to better identify who sits within each ring and when they should be deployed, with the equivalent of first line ‘reserves’ targeted for priority ongoing training and development.

Sustaining links and public health outreach in key populations and settings in line with changing priorities is important

Respondents identified a range of immediate priority populations and settings for which appropriate resources across the network will need to be secured. These included but were not limited to sustaining links and improved public health outreach into CALD and Aboriginal communities, and risk assessment and outbreak management in cruise ships with the resumption of cruises in April 2022.

Maintaining the right level of response capacity in the transition towards the next phase of COVID-19 is a challenge

In the transition towards an endemic state of COVID-19, a key challenge is what functions and infrastructure need to be maintained and at what scale. Maintaining the right level of pandemic response capacity, while having the flexibility to surge workforce, remains a challenge.

Response contraction and return to business as usual has been challenging

The COVID Influenza Branch and PHUs both reported challenges associated with returning to BAU, such as staff exhaustion, missing the 'high' of the response, and a feeling that their former roles no longer matter. Many of these changes occurred with concurrent organisational restructuring in response to the dynamic nature of the pandemic and transition to BAU conditions. There has been significant staff attrition and related loss of expertise with recalibration of the public health response over time.

A major challenge was the repeated expansion and contraction of the public health response while attempting to maintain BAU. There is always a tension between how best to optimise health outcomes. Careful balancing of COVID-19 response and non-COVID BAU operations has been required throughout this pandemic, and will be required in future pandemics.

The pandemic developed a new generation of public health workforce and talent retention should be a priority

The pandemic trained a new generation of public health workforce in communicable diseases, epidemiology and public health operations. Many of these staff are returning to substantive roles in the health system, government, NGOs and the academic sector. A competitive jobs market, ongoing pressure on the public health workforce, and a lack of tenure for staff employed on short-term contracts has resulted in high levels of staff attrition in the public health response. To ensure a sustainable public health workforce it is important that the talent developed during the pandemic is not lost to other fields. Strategies to identify and retain public health workforce talent should be implemented.

Recommendations

Now

5.2.1 Continue to invest in a robust multidisciplinary and culturally diverse public health workforce both centrally and locally, including population health training programs, as this is critical for long-term sustainability of public health preparedness and response.

5.2.2 Maintain a strong medical adviser workforce in the Population and Public Health Division as an important enabler of effective public health response.

5.2.3 Develop a strategy to identify, retain and develop high value public health talent developed across the public health network during the pandemic.

Near future

5.2.4 Improve human resources data systems so they can produce accurate and timely reports of staff deployed in the public health and health system responses, including in LHDs.

5.2.5 Develop and/or collate a suite of training resources that cover key functions of the public health response that can be used to train new staff in any subsequent response surge.

5.2.6 Review existing industrial instruments used to employ public health response staff and determine the most efficient employment mechanisms that accommodate shift work for future pandemics, both centrally and within LHDs.

Future pandemics

5.2.7 Use mass onboarding agreements with key government, non-government and academic partners as an effective public health workforce surge tool in future pandemics.

5.2.8 Make greater use of non-clinical staff with operational management expertise in the central and local public health response.

5.2.9 Formally integrate a dedicated capability that includes human resources, finance, procurement, and strategic planning functions as a relationship manager into the organisational structure of the NSW public health response.

5.2.10 Proactively manage and monitor staff wellbeing using periodic surveys from the start of future pandemics to provide tailored and timely support services and training for frontline public health workers.

5.2.11 Implement public health response structures and support sustainable work practices both centrally and within LHDs, including for highly specialised and leadership positions.

5.2.12 Train and develop capabilities at a senior leadership level under BAU conditions. During a response, boost capability using a flexible approach to draw in and rotate suitably qualified senior staff. This will enhance strategic and other key capabilities, reduce fatigue, and minimise key person risk.

5.2.13 Ensure that future surge planning for case and contact teams includes consideration of skill mix (such as public health expertise, customer service skills, multilingual skills, management and communications), and consider potential sources for accessing personnel, triggers for surging, and methods for scaled escalation.

5.2.14 Maintain separate teams, where possible, early in a response for contact tracing/positive case interviews versus a call centre for public enquiries, to support better customer experience.

Reference

Duckett S, Meehan E 2022, 'As pandemic takes toll on public health workforce, a call for action on burnout in healthcare workers', *Croakey Health Media*, 23 March, <www.croakey.org>.

5.3

Integrating the public health response with clinical partnerships

A central challenge in responding to COVID-19 was the need to integrate public health actions with timely, high-quality clinical services across all areas of the response. Regular and meaningful engagement with health partners and clinical leaders was vital to informing and guiding the response, ensuring timely identification of issues and facilitating a flexible and tailored response. Clinical partners, including GPs and pharmacists, were integral to the public health response for testing and treatment, vaccination, advice to patients, and in their roles as community leaders. Clinical engagement was also an important contributor in countering misinformation.

The context

Bringing together public health intelligence and clinical practice

Each stage of the pandemic had different public health priorities and system responsibilities aimed at mitigating the impacts of COVID-19. There was a constant need to be responsive to the changing context and situation, depending on the phase of the pandemic. The NSW public health response needed to rapidly identify and build on efficient and effective ways for communicating public health decisions with hospitals, general practice, pharmacies, and other parts of the health system engaged in the response.

In the initial phase of the pandemic, a vast education and communication piece fostered understanding of public health principles and COVID-19 literacy across the health system. This included familiarising key operational stakeholders with COVID-19, the evolving evidence, effective infection control measures, and who should be tested.

Policy directives, clinical policy and procedural support were important tools to link public health priorities with clinical and other health professionals' practice. The Clinical Excellence Commission played a key role in developing accessible COVID-19 clinical guidelines as the evidence base evolved. These policies were developed centrally, drawing on up-to-date public health advice, to guide a host of critical activities across the health system. These included operation of LHD COVID-19 vaccination clinics; pharmacy standards and authorisation processes; procedures for administration and storage of vaccines; and managing adverse events and cold chain breaches. Guidelines and risk matrices were translated into useful formats and with content appropriate for clinical stakeholders. The public health teams had significant input into these processes and guidelines.

Importance of clinical engagement as part of delivering public health response

Policy directives, clinical policy and procedural support were important tools to link public health priorities with clinical and other health professionals' practice. The Clinical Excellence Commission, working with public health, SHEOC and Communities of Practice, played a critical role in ensuring safe use of medicines and appropriate incident management guidelines for the operation of LHD COVID-19 vaccination clinics; pharmacy standards and authorisation processes; procedures for administration and storage of vaccines; and managing adverse events and cold chain breaches. These drew on up-to-date public health advice as the evidence base evolved. Guidelines and risk matrices were translated into useful formats and with content appropriate for clinical stakeholders.

Significant efforts were sustained throughout the pandemic for regular engagement between the NSW public health response and an array of medical organisations, peak groups, Ministry Executive groups, and LHD clinical leads. These occurred through a variety of strategic forums, often led by the Chief Health Officer, Deputy Chief Health Officer, Deputy Controllers or Population and Public Health Division medical advisers, but also took place at the LHD level through PHU clinical engagement processes. Examples of statewide engagement included highly subscribed clinical webinars with the Chief Health Officer and Deputy Chief Health Officer through the Royal Australian College of General Practitioners (RACGP). The Office of the Chief Health Officer and the HPNSW Immunisation Team provided updates for LHDs, clinical councils, clinical leaders, and communities of practice. These and other key forums incorporated public health situation updates, evidence updates, explanation of public health orders and public health and social measures, and general Q&A on public health issues (see Case Study 15).

The Public Health Response Leadership Executive and medical advisers met frequently with key partners, such as the RACGP, Australian Medical Association, Pharmaceutical Society of Australia, Pharmacy Guild, and others. In a collaboration between the Clinical Excellence Commission, advisers, and these stakeholders, work ensued on a range of priority concerns, especially on infection control. Significant work included a focus on pharmacies: their safe operation, ensuring awareness of their responsibilities and obligations, and support for their function as a critical portal for the communication of up-to-date public health messages, as well as providers of vaccination services.

CASE STUDY 15

Reaching high priority clinical groups through trusted advice: information update webinars with the Chief Health Officer

Disseminating current and authoritative advice to key clinical stakeholder groups about COVID-19 and the rapidly evolving understanding as to its implications for clinical care was a foundation piece – and sometimes a challenging one – in implementing the NSW public health response.

Recognising that GPs and pharmacists in NSW were integral to a resilient, effective public health response, a program of COVID-19 updates was established, drawing on the expertise of the Chief Health Officer/Deputy Chief Health Officer. Among a myriad of other stakeholder engagement activities, the Chief Health Officer regularly provided updates to the Royal Australian College of General Practitioners (RACGP), Australian Medical Association, Pharmaceutical Society of Australia, and the Pharmacy Guild. For example, she participated in at least 39 COVID-19 update webinars for RACGP members between 2020 and August 2022. These were sometimes interactive and always highly subscribed. Of those with available attendance data, the average GP attendance was 412 per session with a 73% recurrence rate (i.e. 73% of participants attended more than one COVID-19 update).

The Deputy Chief Health Officer also presented at two webinars for the 31 NSW Health COVID-19 communities of practice, focused specifically on the COVID-19 vaccination program. The number of attendees at the two webinars was in the order of 1,000 and 500, respectively.

These webinars were a modality of necessity, given restrictions as well as efficiency. They created an enormous opportunity to reach thousands of GPs, pharmacists, and other health professionals with the most up-to-date information relevant to their practice.

Evolving COVID-19 testing strategies was key to the public health response

Engagement with NSW Health Pathology and private laboratory providers about ad hoc and specialised testing requirements, community surveillance, and testing capabilities was essential. Innovative testing approaches were developed in collaboration with private providers, local councils and LHDs to support a rapid public health response for enhanced case identification and rapid contact tracing in the LGAs of concern, for example in Fairfield.

The changing nature of the testing strategy needed to be communicated to the health system through each wave of the response. As COVID-19 waves progressed, the health system and other sectors became more familiar with testing regimens. The initially high informational burden gradually reduced and became more targeted, for example to the impact of evolving public health orders on business or practice (see Chapter 3.1 for further information about testing).

Public health expertise to inform vaccination program rollout

Vaccination is a key component of the NSW Health response to COVID-19. SHEOC led the vaccination program rollout in collaboration with the Commonwealth and was pivotal in the statewide implementation. LHDs were a significant engine behind the vaccine rollout, and they provided a sustained commitment through vaccination hubs and provision of staff.

Ensuring the safety of the vaccine rollout was also a critical responsibility of the Ministry. Establishing the facts associated with the safety of COVID-19 vaccines was particularly important in the early phase of the vaccine rollout when there was a need to build public confidence in vaccination. Early in the rollout, Population and Public Health Division medical advisers brought together clinical and technical expertise and advice, academic insights, the Chief Pharmacist, and the Clinical Excellence Commission to inform the development of enhanced surveillance of adverse events following COVID-19 immunisation in NSW (NSW Health, 2022).

Establishing the facts about adverse events following COVID-19 vaccination was critical to evidence-based decision making and clinician understanding of vaccination risk. The Population and Public Health Division team collaborated with NCIRS (who provided expert clinical support) and coordinated expert panels conducting case reviews; collaboration with forensic pathology and state reference labs for specialist haematology services; and referral and reporting to the TGA and others. Case Study 16 describes how enhanced COVID-19 vaccination adverse events monitoring, investigation and reporting in NSW was established in collaboration with key clinical stakeholders.

Key learnings and achievements

Communicating with clinicians and peak bodies about what was known about COVID-19 was critical throughout the pandemic

It was vital throughout the pandemic to foster an understanding of public health principles and improve COVID-19 literacy across the health system. This included familiarising key clinical stakeholders with COVID-19, the evolving evidence on transmission, effective infection control measures, who should be tested and, later, who should be vaccinated. As Case Study 15 illustrates, the Chief Health Officer, Deputy Chief Health Officer, Deputy Controllers and Population and Public Health Division medical advisers regularly briefed key medical and pharmacy peak bodies on the latest COVID-19 evidence, ultimately reaching thousands of clinicians across the pandemic – a significant achievement given their already expansive workloads.

Linking clinicians to the latest evidence about adverse events from COVID-19 vaccination facilitated evidence-based practice and effective clinical decision making

Monitoring adverse events following immunisation (AEFI) provides an early warning of a potential safety problem with a vaccine. Patterns of adverse events, or an unusually high number of adverse events reported after a particular vaccine, are called 'signals'. If a signal is identified through the AEFI system, further studies may be conducted to find out if the signal represents an actual risk. Hence, systems for AEFI surveillance are critical in building clinical and public confidence in vaccine safety.

The enhanced surveillance of adverse events following COVID-19 immunisation in NSW was the most comprehensive system of its kind in Australia and a major achievement.

Key components of the enhanced system in NSW included daily reports to the Chief Health Officer and the TGA; enhanced reporting to the Ministry, the NSW Coroner and Forensic Services; and increased and enhanced expert panels to address complex cases, diagnostic uncertainty and family concerns. NSW was also an important contributor to AusVaxSafety whereby everyone attending a NSW Health COVID-19 vaccination hub received a text message or email with a link to an online survey 3–8 days after vaccination. The survey included questions regarding AEFI, any medical care or advice sought, and impact on daily activities and recovery. Results from the survey produced critical research led by NCIRS that affirmed the safety profile of the Comirnaty and Vaxzevria vaccines in the first six months of the Australian COVID-19 vaccination program (Deng et al. 2022).

Drawing on clinical expertise to inform and develop the public health response was fundamental to success

Clinical research groups such as NCIRS and expert clinicians were a key resource for the response. To support adverse event monitoring and investigation, updates and briefings were provided to clinical groups across the state on vaccine safety and effectiveness with support from clinical experts. Several expert panels were also convened by public health during the response: the Excess Mortality expert panel that guided changes to the already established Rapid Mortality Surveillance expert panel to better suit the COVID-19 context; the Adverse Events Following Immunisation expert panel (discussed in Case Study 16); and expert panels on the use of COVID-19 antivirals in high-risk adult and paediatric populations. Consultation and engagement between public health, clinical networks and LHD clinical groups – and using existing clinical channels and governance structures for clinical updates and alerts – was essential and warrants continued investment.

Integrating public health advice and clinical responses at an individual patient and broader system level is critical

Providing clear and consistent information on COVID-19 transmission risk, variant characteristics, vaccine effectiveness and enhanced adverse event monitoring was essential for effective clinical practice during the pandemic. Ensuring good support for GPs and pharmacies rolling out vaccines mattered, with links to authoritative health advisers, and a central up-to-date repository for fact sheets and guidelines for adverse event reporting.

Collaboration with SHEOC was critical to effective engagement with clinicians throughout the pandemic in numerous areas, including testing policy implementation, streamlining the approach for clinical and public health to work with residential care facilities, and building critical care and emergency department capacity, among others.

Clinical councils and communities of practice established by NSW Health during the pandemic were important mechanisms for two-way clinical communication and feedback that enabled an additional pathway for identifying current health system issues. The NSW public health response regularly used these fora (also including established LHD grand rounds and clinical councils, primary health network and GP network seminars) to communicate about public health action and evidence and to hear clinician concerns.

CASE STUDY 16
Developing enhanced surveillance of adverse events following COVID-19 immunisation in NSW

Prior to COVID-19, the process for reporting and managing adverse events following immunisation (AEFIs) was routine 'business as usual' for NSW public health units (PHUs), with approximately 650-800 AEFI reports through to the Therapeutic Goods Administration (TGA) each year, and high-level adverse events of significance (including deaths) requiring expert panel review occurring every 1-2 years.

On 22 February 2021, the first COVID-19 vaccine became available, and the NSW vaccine rollout began. The increase in vaccines administered – and resulting increase in adverse events and workload of the NSW health system – necessitated the development of an enhanced surveillance and reporting program for AEFIs (the COVID-AEFI program). This involved:

- enhanced surveillance and signal detection from the Public Health Rapid, Emergency, Disease and Syndromic Surveillance (PHREDSS) system, laboratories, clinicians, PHUs and the TGA
- daily team huddles with direct reporting to the Chief Health Officer, and escalation when necessary for cases of concern
- daily immunologist reviews of reported cases
- enhanced reporting to the TGA with early flagging of high-risk cases and detailed case reports
- weekly statewide email communication regarding reporting requirements for AEFIs, clinical management of AEFIs, and updates from the TGA website and ATAGI (Australian Technical Advisory Group on Immunisation)
- expert panels to address complex cases, diagnostic uncertainty and family concerns.

This enhanced process placed considerable strain on the workloads of PHU and Ministry staff. Further, the Ministry and TGA grappled with the heightened public scrutiny of AEFIs resulting from the COVID-19 vaccine. Rapid recruitment occurred to support AEFI reporting, investigation and advice; the Ministry's COVID AEFI Team grew from two staff members to more than 20 over 4–6 weeks. However, this adaptation was seen as necessary and impactful. The investigation and proactive management of AEFIs through this enhanced system also increased vaccine confidence and acceptability in the NSW community.

Recommendations

Now

5.3.1 Continue to engage with and communicate information to clinical networks and peak bodies about COVID-19 as new variants emerge and when there are major shifts in strategic approaches and the evidence base.

5.3.2 Maintain strong working relationships with primary care, continue the RACGP webinar program for critical public health issues, and investigate expanding the webinar program to the pharmacy sector.

Future pandemics

5.3.3 Include enhanced surveillance of adverse events following immunisation in future public health responses, as this was an important tool to build clinician and public confidence in vaccination.

5.3.4 Continually disseminate trusted advice about infectious diseases, public health measures, and associated implications for clinical practice to key clinical stakeholder groups as a vital part of the public health response.

5.3.5 Establish scalable systems and processes early to integrate public health and clinical responses to individual cases and, where relevant, for BAU conditions.

Reference

Deng L, Glover C, Dymock M et al 2022, 'The short-term safety of COVID-19 vaccines in Australia: AusVaxSafety active surveillance, February – August 2021', Med J Aust, vol. 217, no. 4, pp. 195-202, DOI:10.5694/mja2.51619.

NSW Health 2022, Adverse event following immunisation control guideline, https://www.health.nsw.gov.au/Infectious/controlguideline/Pages/adverse.aspx

5.4

Media and communications

Empowering the public with the right information was critical for the response. Effective communication strategies can build public trust and confidence, and help the community understand the behaviours needed from individuals, communities and organisations to prevent the spread of disease during pandemics (Siegrist and Zingg 2014). Effective communication during a public health crisis is not merely about messaging. Instead, it is an interactive process of exchange of information and opinion among individuals, groups and institutions (Hyland-Wood et al. 2021). Communication with the public and stakeholders was a vital enabler of effective public health response in NSW.

The context

Effective communication was essential. Media and communications were central pillars of the public health response from the start of the pandemic. From early 2020, there was a huge level of public and media interest in COVID-19 and the need for comprehensive and agile media and communications responses. The Ministry of Health established dedicated COVID-19 media and communications teams, servicing both the PHEOC and SHEOC.

The COVID-19 Communications Team coordinated and enacted high-volume communication requirements for both the SHEOC and PHRB, in addition to requests from cross-government agencies and external stakeholders. This included drafting communication strategies, developing and reviewing resources, content and advertising campaigns, as well as extensive stakeholder engagement to respond to outbreaks, the emergence of new variants, changes to public health orders and restrictions, and evolving vaccination advice.

The COVID-19 Media Team managed all media enquiries and proactively produced media releases and statements to inform the public of important developments and raise awareness of public health advice. Working closely with the PHEOC and SHEOC, a daily media release was issued containing the latest COVID-19 data and statistics and public health advice, while earlier in the pandemic media releases were issued with case location alerts as required, often multiple times a day.

The Media Team supported the NSW Government's COVID-19 media conferences. Media conferences were held with varying frequency across the pandemic, from daily during the initial phase of the pandemic in 2020, becoming less frequent between waves, to daily again from June to early October 2021.

These media conferences were a key mechanism for communicating with the public about case data, deaths, vaccination rates, public health advice and changes to public health orders. They were also an important dialogue with the public about the course of the pandemic and to promote the need for vaccination and the importance of complying with orders. Media conferences routinely involved the Premier, Minister for Health, Chief Health Officer, Police Commissioner and SHEOC Controller and were also attended by AUSLAN interpreters to increase accessibility. They were streamed live by NSW Health through social media channels and were made available to view on the NSW Health website and social media channels afterwards. Multicultural media conferences were also held specifically for CALD media to ensure the smaller outlets serving these communities had the opportunity to ask questions relevant to their audiences. These were mainly held online, but also face-to-face.

The Ministry Media Team worked closely with LHD media teams dealing with enquiries from regional and local media. Ministry media and communications teams also participated in weekly meetings with their counterparts in LHDs. These meetings enabled Ministry teams to discuss approaches with and take questions from LHDs. While LHDs delivered their own locally targeted and tailored media and communications, the Ministry media and communications teams shared materials and resources that were relevant statewide.

Most of these materials and resources were developed by the Ministry, and LHDs then shared these on their social channels, newsletters and websites. Other formal communications channels between the Ministry and LHDs were regular calls and update emails as public health orders changed and as new materials became available. This regular written and oral communication connected the Ministry with the LHDs and built strong collaborative relationships.

The Ministry COVID-19 Communications Team oversaw the development of communication strategies, campaigns, and content across several communications channels. The team helped to keep the NSW public and stakeholders informed through stakeholder engagement, social media, campaigns, the NSW Health and NSW Government websites, and events.

At the start of the pandemic the focus was on getting information about health risks and rules out to consumers quickly. This transformed into a more behaviour change-focused approach as the vaccination program rolled out, restrictions were amended and reduced, and models of care changed for those at higher risk. The 'Help us save lives / Help us stop the spread' citizen safety campaign promoting COVID-safe behaviours provides an example of the campaigns (see Case Study 17).

The public, business and government were key audiences at all times during the pandemic, however target audiences were modified as necessary depending on the advice needed, or the insights garnered from both NSW Health and other government agencies. As well as the citizen campaigns, various statewide COVID-19 business campaigns have run since 2020 (see Case Study 18). There was a significant shift to focusing on CALD populations during the Delta wave, particularly those in Western and South Western Sydney (see Chapter 4.2 *Culturally and linguistically diverse communities*). Local media and communications strategies were implemented with the relevant LHDs to reinforce statewide messages, but also to give key messages around public health measures, including restrictions and public health orders, and to give vaccination a local perspective and relevance.

Additional large scale and highly targeted statewide public health citizen advertising campaigns, including 'Help us save lives / Help us stop the spread', 'Help NSW stay COVID safe' and 'Let's do this' were successfully implemented featuring NSW Health frontline health professionals, and were in market during 2020 and 2021. These campaigns were fully integrated across all channels. The 'Let's do this' vaccination campaign had significant reach (2.2 million people through television, 1.8 million through metropolitan radio, 1.2 million through metropolitan press and 5.1 million through digital). Additional campaigns in late 2021 and 2022 focused on third doses for people who are immunocompromised, a booster vaccination strategy for people aged 18+, a cross-government communication strategy for vaccination of children aged 5–11 years, and 'The little Things' campaign to reinforce public health measures.

CASE STUDY 17
COVID-19 'Help us save lives / Help us stop the spread' citizen safety campaign

This large scale and highly targeted statewide public health advertising campaign, featuring frontline health professionals, was in market during 2020 and early 2021. It focused on promoting COVID-safe behaviours, including testing, staying home if unwell, mask wearing, physical distancing, hand hygiene, gathering outside or in well-ventilated areas, as well as checking-in and proof of vaccination in the later stages of the campaign. The campaign also promoted mental health and wellbeing. It was fully integrated with channels, including television, radio, print, outdoor, digital and social media.

Additional communications were issued as part of this campaign during outbreak periods (e.g. December 2020, June–October 2021) to keep in line with rapidly evolving health advice. These activities leveraged real-time data and provided critical information about restrictions, case locations and COVID-safe behaviours to drive people to the NSW Government website. They included in-language assets and a bespoke Aboriginal creative approach.

The third phase of this citizen campaign achieved 59% campaign recall (target 35%) and those that had seen the campaign were more likely to report they agreed with or followed COVID-safe behaviours.

CASE STUDY 18
COVID-19 Staying Safe business campaigns

Various statewide COVID-19 business campaigns have run alongside the citizen campaigns since 2020. These have focused on how businesses and their staff can stay COVID-safe (such as checking in, mask wearing, reminding staff to only go to work if well, developing and implementing COVID-19 safety plans, adhering to public health orders), and accessing financial and concierge support to help them stay in business. The creative showed a variety of businesses and staff.

The campaigns were fully integrated across radio, press, social and digital, with in-language materials and channels for culturally and linguistically diverse (CALD) businesses. There was up-weighted campaign activity during outbreak periods (e.g. July–September 2021) across radio, social, CALD social, digital, press and search engine marketing. They were supported with significant stakeholder engagement (e.g. regular business eDMs, toolkits, etc) to keep businesses updated on the latest developments and changes and supporting collateral (such as posters, signage, and social tiles). The second phase of the business campaign in 2021 achieved 68% campaign recall (63% target) and 91% message take-out (50% target).

NSW Health communications were informed by public health advice as well as ongoing customer insights, much of which has been led by DCS, focus group research, campaign evaluation, COVID-19 data (including testing and vaccination), and local 'on the ground' insights, including from LHDs, Multicultural Liaison Officers, Aboriginal Medical Services and social media. In addition to the significant proactive communications, press conferences were also an important ongoing communication strategy.

Key learnings and achievements

Media and communications are critical elements of effective public health response

Strong relationships between media and communications teams and operational teams, centrally and locally, were crucial to the success of the public health response. Media and communications teams should be engaged early and proactively, with this engagement working best when they have a seat at the policy table.

Media conferences are a critical communication vehicle with the public

Media conferences reached very wide audiences and enabled Government and the Chief Health Officer to speak directly to the public. They were an effective way to communicate important updates and the rationale for changes, as well as to appeal to the public with respect to critical health advice, including that related to restrictions, public health measures and vaccination. They also allowed the media to put questions directly to the Government and NSW Health.

Despite the obvious benefits of media conferences from a communications perspective, when they occurred seven days a week they had resource implications for the Chief Health Officer and the wider PHRB, who were required to respond rapidly to requests for data.

Having a pool of media-trained spokespeople can assist in effective communication

Having a pool of culturally diverse media-trained spokespeople prior to the pandemic across NSW Health would have assisted development of proactive media content centrally and locally.

Spokespeople, including those with diverse cultural backgrounds and language, were drawn from the public health response workforce but not all had been provided communications training. Proactively identifying and maintaining this capacity in BAU is essential.

Ensuring clarity of key resources and policy guidelines is important

It was challenging to meet the information needs of people with lower health literacy or from CALD backgrounds during the pandemic. Studies have shown that the complexity of most government-produced COVID-19 information in Australia and overseas exceeded the recommended grade 8 reading level, making it too difficult for general audiences let alone people with lower health literacy (Mishra and Dexter 2020; Mac et al. 2021).

It is important to acknowledge that the sheer volume, frequency and often complexity of changes to policy settings made it challenging to develop resources and guidelines in a timely fashion and to ensure their readability. However, there would be merit in future pandemics in ensuring clarity of key resources and policy guidelines developed and making this part of review and approval processes before public release. This often happened informally but it was not a systematic practice. Ensuring availability of high-level policy expertise, coupled with this communications lens, was thought to offer optimal results in the pressured environment of a public health response.

Integrating media and communications teams into policy and operational processes ensures robust communication strategy

Media and communications teams were integrated into policy and operational processes in the central public health response from the outset of the pandemic. Media and communications should run alongside the planning and implementation stages of public health action. Early engagement of the communication team ensures more robust communication strategy and mitigates risk of delays in producing content and engaging the public and other important stakeholders with key messages.

Effective communication with target audiences requires insights and data from multiple stakeholders

Effective communication with target audiences requires insights from multiple stakeholders and processes, including public health teams, clinicians and health staff on the ground, in addition to consumer research, campaign evaluation and COVID-19 epidemiology and surveillance data.

Communications also needed to be informed by public sentiment as the pandemic evolved and community attitudes and the context changed.

Local intelligence is critical to the development of effective communications strategy

Importantly, 'on the ground' insights are essential from LHDs, Multicultural Liaison Officers and Aboriginal Medical Services when targeting local settings and communities, and monitoring social media sentiment is vital. Combining these data sources again with local epidemiological and surveillance data builds more robust and tailored media and communications strategies that can achieve higher levels of reach and engagement with target audiences. Communications should be co-designed with cultural experts and delivered by trusted local leaders embedded within the community who help develop shared language and leverage reach with local communities. Messaging must be evidence based and inclusive of impacted communities.

Real-time translation in multiple languages was also an effective communication strategy. Technology innovations, such as using sound files embedded in text messages, also supported messaging to hard-to-reach cohorts.

Messaging must be evidence based but also salient

Messages need to be both evidence based and inclusive of communities most impacted. The NSW population has an expectation for more information and research than ever before. This evidence must be built into and inform communication approaches.

A 'one size fits all' communications approach does not work in a multicultural society

Extensive engagement with CALD audiences and relevant stakeholders is integral to deliver targeted messaging and keep communities informed. Embedding staff from the Multicultural Health Communication Service in the Ministry Communications Team was central to this by leading translation of content into over 60 languages and undertaking stakeholder engagement with community and religious leaders, non-government multicultural and ethno-specific organisations. A 'one size fits all' approach does not work in a multicultural society. Tailored messaging reviewed by cultural experts takes time to produce but is necessary for effective communication with the whole community.

Multi-channel communications that include all available communication and stakeholder engagement channels are essential

All communication channels need to be utilised during a public health response. This enables content to hit different target audiences and leverages reach. By adapting content to different channels, the community can be successfully kept informed, whether this be through website, social media or newsletter updates, stakeholder packs, or receiving information through internal and external stakeholders on the ground. Developing targeted communications to respond to outbreaks in identified demographics or geographical areas, and tailoring the message to the medium, ensures the appropriateness and accessibility of information.

Integration with whole-of-government communications is critical

NSW Health input into whole-of-government communications ensures the communications are accurate and reflect current health advice. Building strong and trusted relationships across government, including leveraging their channels, increases the distribution and proliferation of messages and content. Key relationships gained during the COVID-19 response included DCS, Department of Premier and Cabinet, Department of Education, Department of Communities and Justice, NSW Police Force, Office of Local Government, and Transport.

Media campaigns should reach the whole population

Achieving high levels of campaign reach across the whole population, including CALD and Aboriginal people and other marginalised groups, requires a suite of appropriately resourced multi-channel communications strategies accompanied by local community engagement.

NSW Health social media channels have grown exponentially during the COVID-19 pandemic and these must continue to be used as a key channel for public health messaging to diverse audiences.

Misinformation must be proactively managed

Misinformation must be countered quickly. It must also be addressed by multiple sources, and consistently, to counter the myths in a coordinated manner.

Recommendations

Now	
5.4.1	Continue to include media and communications teams in key COVID Influenza Branch/HPNSW public health policy and operational team meetings to improve situational awareness.
5.4.2	Continue joint planning between media and communications teams and public health teams to understand the policy and operational context and to support the development of proactive media and communications that meet strategic need.
5.4.3	Continue to use all available communication and stakeholder engagement channels for promotion of public health messaging and proactively countering misinformation.
5.4.4	Public health response teams should continue to draw on and work closely with media and communications teams to ensure clarity of key resources and policy guidelines prior to public release.
Near future	
5.4.5	Maintain a pool of diverse, multilingual media-trained NSW Health public health staff and physicians who can be public health response spokespeople and can also feature in proactive communication activities both centrally and locally.
Future pandemics	
5.4.6	Expand BAU communications capabilities and, under pandemic conditions, augment with additional CALD and Aboriginal communications capability in a dedicated team.
5.4.7	Ensure communications campaigns are effective by using a combination of mass media, web based, social media and local community engagement, and including tailored strategies to reach CALD and Aboriginal populations.
5.4.8	Ensure communications campaigns are accompanied by community engagement strategies implemented in collaboration with LHDs and community organisations on the ground to achieve better reach to vulnerable communities.

References

Hyland-Wood B, Gardner J, Leask J et al 2021, 'Toward effective government communication strategies in the era of COVID-19', *Humanities and Social Sciences Communications*, vol. 8, no. 30, DOI:10.1057/s41599-020-00701-w.

Mac OA, Muscat DM, Ayre J et al 2021, 'The readability of official public health information on COVID-19', *Med J Aust*, vol. 215, no. 8, pp. 373-5, DOI:10.5694/mja2.51282.

Mishra V, Dexter JP 2020, 'Comparison of readability of official public health information about COVID-19 on websites of international agencies and the governments of 15 countries', *JAMA Network Open*, vol. 3, no. 8, DOI:10.1001/jamanetworkopen.2020.18033.

Siegrist M, Zingg A 2014, 'The role of public trust during pandemics: implications for crisis communication', *European Psychologist*, vol. 19, no. 1, pp. 23–32, DOI:10.1027/1016-9040/a000169.

5.5

Information systems and capacity

During a pandemic, information systems play a critical role in managing data and other information at the speed the situation requires. They provide essential evidence for action, making the most informed decisions possible, and adjusting policies to allow for better intelligence on actions to improve health (PAHO 2020). NSW Health constantly adapted a range of information and technology systems to support the public health response to COVID-19. This included systems for surveillance, case and contact management to collect and share information across the public health network that occurred in line with applicable privacy legislation, and to inform policy action. This was particularly important in the context of a novel virus where there was limited existing information to inform practice.

The context

Surveillance platforms

Before COVID-19, NSW Health had well established information systems for surveillance and management of communicable diseases in NSW. The two main systems used for this purpose were the Notifiable Conditions Information Management System (NCIMS) and the NSW Public Health Rapid, Emergency, Disease and Syndromic Surveillance (PHREDSS) system (used for surveillance only). This put NSW Health in a strong position early in the pandemic to support the public health response to COVID-19, noting these systems were intermittently pushed to their limits given the scale of the response required. Existing systems were adapted and expanded throughout the course of the pandemic to meet the needs of the public health response. New systems were established when capacity limits of existing systems were reached or when new functionality was required. The pre-existing capacity of NSW Health to build and manage systems was a strength of the public health response.

NCIMS is the foundational system used by all LHDs and HPNSW to support all routinely notifiable conditions. NCIMS supports reporting, management of cases and contacts, and outbreak management. One of the first information system actions in early 2020 was to establish a COVID-specific data capture mechanism in NCIMS. Over time this grew to capture an increasing range of information, beyond what is typically captured in NCIMS. This included data not just about confirmed and suspected cases (the usual data managed in NCIMS), but also contacts of cases, negative test results, outcomes of surveillance testing for people working in potential exposure settings, and recovery data.

The NCIMS platform managed an unprecedented increase in information and user access as a result of the pandemic. At times, system performance and storage capacity were greatly impacted. To stabilise the system (and in response to major incident alerts), additional servers were added and current servers were modified to increase capacity. A major systems development in September 2021 was the release of NEGCOV, a large database for the capture and storage of negative COVID-19 test results. NEGCOV improved the capacity of NCIMS by creating a separate instance of the system specifically to store the extraordinary volume of data associated with negative test results.

If negative COVID-19 test results had continued to be captured in NCIMS, there would have been significant impacts on the ability of the system to process, analyse and report surveillance data, not just for COVID-19, but for all other notifiable conditions.

The utility of data captured in NCIMS was enhanced at different points in the pandemic through linkage with other systems, including the Australian Immunisation Register, NSW Registry of Births Deaths and Marriages, the Service NSW rapid antigen test registration system and the NSW Health Patient Flow Portal. These linkages enhanced decision making by connecting public health surveillance data and clinical information (see Case Study 19).

The PHREDSS system is another critical NSW Health public health surveillance tool. PHREDSS provides intelligence on public health issues and identifies unusual patterns of activity using emergency department, death registration and ambulance call data. PHREDSS was used during the pandemic to enhance case finding and provide rapid intelligence to policy and response teams regarding mortality rates, emergency presentations for respiratory illness and their severity, and adverse events following immunisation. It was also used to monitor the indirect impacts of policies on injury, mental health, and harms from alcohol and other drugs.

Systems to support case and contact management

The NSW COVID-19 public health response required a high level of case and contact management. This was a key component of the TTIQ approach to reduce transmission of the virus. In the early stages of the pandemic, case and contact information was managed through relatively manual processes, including paper-based case interview forms and Excel spreadsheets. Data was then entered or uploaded into NCIMS to support reporting and ongoing follow-up of both cases and contacts. This approach was unsustainable as case numbers grew. Two online platforms were developed and implemented from September to November 2021: the COVID-19 Case Assessment System (CCAS) and the COVID-19 Contact Notification (CCON) system. These systems digitised interviews and automated associated workflows to allow case and contact management at scale. Integration with NCIMS was a key element of this process to ensure information was automatically moving between the systems.

CASE STUDY 19
Connecting available data and systems to respond to COVID-19: implications for real-time monitoring of hospitalisations and impact on public health decision making

At the onset of the pandemic, it was identified that an important indicator of the response would be COVID-19 morbidity and mortality and the impact on the NSW Health system. This data was necessary to inform public health policies and broader health system planning. Experience during the H1N1 pandemic identified that access to this information relied on manual and resource intensive processes and was not sustainable, particularly as case numbers increased. Existing systems were not designed for this purpose and a novel approach was required.

In early 2020, a cross-divisional project – the Rapid Critical Care Surveillance Project Control Group – was initiated to develop and systematise the use of available data and platforms to rapidly identify and report COVID-19 hospitalisations and ICU admissions. It was identified that the Patient Flow Portal (PFP) and the Notifiable Conditions Information Management System (NCIMS) held the information required and connecting these data would be an important tool in the response.

A pilot was implemented in February 2020 to test an automated linkage process between NCIMS and PFP patient data for historical influenza records. This would allow the application of COVID-19 test results on any matching patient within the PFP. In addition, a standard data linkage program was undertaken with the Centre for Health Record Linkage (located in the Centre for Epidemiology and Evidence) as an indicator of health system impacts of COVID-19 over time.

Following the initial pilot, the Project Control Group implemented the routine provision of COVID-19 patient data to PFP for real-time linkage and daily reporting on 16 March 2020. Several enhancements were implemented over the course of the pandemic as new requirements emerged, particularly driven by the surge in cases from mid-2021 during the Delta wave. This work involved:

- inclusion of people diagnosed with COVID-19 but not hospitalised to assist connection with clinical follow-up and release from isolation/quarantine
- use of triage questions via NCIMS to prioritise public health response and referral into clinical care through the PFP
- capture and use of rapid antigen test registration data via Service NSW, initially to support referral for priority clinical care and expanded to enhance understanding of community testing and case identification.

Connecting the available data from existing systems resulted in rapid automation and real-time visibility of health system impacts of COVID-19 and public reporting. In addition, hospitalisations and intensive care unit numbers for people diagnosed with COVID-19 were able to be reported in near-real-time to inform public health decision making.

As case numbers increased, the use of technology to prioritise triage of response and communication to COVID-positive people in the community was critical.

Use and connection of available data to inform response requires early engagement, appropriate governance arrangements, and investment to ensure successful implementation of solutions that are fit-for-purpose, scalable and supported. Operational implications in creating connections between the public health response and clinical care should be considered through governance and decision-making forums.

Cases often visited public settings (e.g. schools, retail, workplaces) during their infectious period (before commencing isolation). Recording details about these venues for the purposes of risk assessments and communication to potential contacts (via direct communication and media/website announcements) involved significant data management. This data was initially managed through spreadsheets, however as case numbers grew during the Delta wave in 2021, this became unmanageable due to the volume of information and the number of people accessing the spreadsheets. An online platform, Venue Tracker, was developed and deployed in September 2021 to manage the volume of data associated with

venues visited by cases. This system could easily capture information, generate workflows to support management of risk assessments, and generate reports for analysis and media releases. Venue Tracker created a more stable environment to manage information and supported collaboration across the network. In December 2021, CCAS and Venue Tracker were integrated to support automatic updates from case interviews into Venue Tracker. These learnings will inform the development and functionality in SIGNAL.

Systems to support communication with cases and contacts

Utilising technology that allowed communication to both cases and contacts via text message at scale was a key development in the public health response. A system previously used by HPNSW, Prodocom, was used throughout the pandemic to send bulk text messages to people in the community. The benefits of this system were its ease of use and ability to tailor information to the context, with personalisation. The response used this system for many purposes but most commonly to rapidly notify people of their potential exposure to a COVID-19 case or to remind them of requirements as contacts (e.g. the need to test at certain times). One of the limitations of this system was that information was unidirectional – from NSW Health to individuals – so it could not be used to collect information from individuals. Additionally, there was no integration with other systems such as NCIMS. While messages could be processed in bulk there were complicated business rules requiring manual configuration for different types of contacts/people of interest depending on their exposure setting. As the volume of contacts/people of interest and exposure settings increased, the resource demand and error risk also increased. Process improvements were introduced to reduce this burden and facilitate auto-population of fields as much as possible, however, Prodocom remained a resource intensive system.

In May 2020, NSW Health deployed a platform called Whispir to facilitate two-way communication with contacts. Whispir was integrated with NCIMS and used to send follow-up text messages to close contacts (after an initial phone call), checking on their wellbeing. Contacts were asked to respond to a text message every second day, indicating if they had symptoms, needed welfare assistance or had any other concerns. Workflows were automatically generated to call people who raised issues or who had not responded. This system allowed the response to communicate with a high volume of contacts while directing limited calling capacity to people with concerns or in high-risk categories. This was particularly important during periods of high case volume.

In August 2021, the functionality of Whispir was expanded to include cases. A 'triage survey' for new cases was implemented that allowed NSW Health to prioritise case interviews for people in high-risk categories or who had been in high-risk settings during their infectious period. This meant available staff could be directed to the case interviews with the highest public health and clinical value.

NSW Health managed a high volume of interactions with cases, contacts and the general community. Information systems were used to improve capacity in this space. Phone calls to and from Ministry teams were initially managed using softphones (Avaya) and a series of cascading mobile telephones. This system was not suitable for the large-scale inbound call volumes generated at times of high case numbers or significant public health policy change. This often led to long wait times.

Call centre infrastructure

In February 2021, the Ministry procured and implemented a call centre system to support the CCTT. TRACIE (Test Trace Review Assess Contact Investigate Escalate) was designed to automate workflows and simplify data collection and communication processes for contacts. It was comprised of two key components: a telephony component using Genesys and a contact management component using cStar. The deployment of the Genesys component provided greater flexibility to manage increasing call volumes and improved call quality through auditing functionality. This system also gave NSW Health the ability to redirect calls. General COVID-19 enquiries were diverted to Service NSW. The generic 1300 phone line for PHUs was temporarily redirected to the large Ministry-based team to triage calls or resolve, as appropriate. This reduced call wait times and burden on PHUs who had less capacity to surge large teams. Call centre technology allowed NSW Health to better prioritise calls and improve the experience of the community when interacting with the organisation. The contact management component (cStar) was not deployed as it became apparent access was required statewide and system modifications to support changes to

contact management requirements could not be implemented quickly enough. This requirement was subsequently delivered through the CCON system.

In October 2021, the Service NSW venue check-in application commenced automatic notification to contacts, notifying them if they had been at a venue at the same time as a case. While this platform was outside the NSW Health managed systems, it was a key step in supporting rapid, at-scale communication with contacts and it reduced the burden on NSW Health.

Systems to support collaboration

Information systems were also critical for collaboration within teams and across the public health network. Centralised information systems allowed NSW Health to capitalise on the capacity of the network. While NCIMS is a centralised system, person records are allocated and assigned to the appropriate LHD based on residential address. The creation of a process to allocate cases across LHDs, and a workflow within NCIMS to distribute the work across the network, were critical changes in the response that enabled PHUs with lower caseloads to support those with higher caseloads.

There was recognition very early on that COVID-19 would be a special case for data needs, and so data management and access across the network needed to reflect this. Constraints associated with the usual data management channels for other communicable diseases would not meet the needs of the public health response associated with COVID-19. A decision was made to manage data access uniquely using a shared network drive rather than the existing infrastructure used to manage all other communicable diseases.

Respondents expressed challenges with having appropriate tools to support workflows within their team and collaboration across teams. While some of the COVID-specific systems supported these activities (e.g. CCAS), they did not cover the full range of work undertaken in the response. Collaboration tools like Trello (a visual tool to manage projects, workflow and task tracking), Microsoft Teams and SharePoint were used within and across many teams to support sharing of information and to manage workflows. Email was commonly used to distribute work. While these tools were useful, they were not always fit-for-purpose and teams were constantly trying to improve processes to work more efficiently.

It should be noted that this is not a complete summary of all information systems used throughout the response but captures some of the key systems and changes that were instrumental in managing outbreaks.

Key learnings and achievements

Despite the challenges, NSW Health was able to leverage existing information systems and rapidly develop new platforms

NSW Health was able to leverage existing information systems and rapidly develop new platforms to support the COVID-19 public health response. The speed in which systems were developed was a significant achievement. It should be noted, however, that more systems do not necessarily mean a better response. People with visibility of systems and processes are needed to ensure there is no duplication of effort or unnecessary steps.

Developing and improving systems requires the right combination of technical skills and subject matter expertise. Being able to bring these two things together was challenging due to the operational workload on key people in the response but it was also a critical element to the success of the NSW Health systems. Before COVID-19, HPNSW and CEE had significant technical skill within their teams in relation to NCIMS, PHREDSS and other information systems. While this was a strength in managing systems throughout the pandemic, it should not be the only resourcing strategy. When systems are managed in-house, organisations are limited by the pool of internal resources. It is important to work with other technical teams across the Health cluster, such as eHealth NSW, as well as with other agencies and commercial providers, to support at-scale work.

Patient Flow Portal and NCIMS integration early in the pandemic provided critical data, linking cases with hospitalisation and ICU admission data

The integration of the Patient Flow Portal with NCIMS early in the pandemic allowed the linking of cases with hospitalisation and ICU admission data. This provided critical information for both the public health and health system responses and highlighted the value of better integration of public health surveillance and clinical information systems.

Integration between PHREDSS and the Patient Flow Portal Operational Data Store (ODS) enables public health surveillance using the broader set of clinical data in the ODS, improving situational awareness of pandemic impacts on the health system. Given these benefits a transition to sourcing rapid emergency department data from the Patient Flow Portal ODS is underway.

The learnings derived from the pandemic response should be embedded in the functionality of the new system, SIGNAL

COVID-19 has highlighted the critical requirement for surveillance and outbreak response capabilities to ensure NSW can continue to detect and respond rapidly to control infectious disease outbreaks and remain at the forefront of pandemic preparedness. This requires development of enhanced and automated systems to manage a response to large-scale public health threats.

While NSW Health had many significant achievements across a range of information systems, there were challenges. Respondents often noted that systems were developed to meet a current demand and needed continuous enhancement to ensure they remained relevant. As previously mentioned, the governance structure at times impacted on the availability of key internal stakeholders to contribute to and approve systems. Heavy operational demands limited the availability of senior staff to drive the technical program of work and ensure any system changes and enhancements were tightly connected to commensurate workforce and process changes.

Related to this, systems and key stakeholder relationships need to be built under non-pandemic conditions. Systems should be broad and agile so they can be adapted to the specifics of emerging situations. COVID-19 has demonstrated that we need a framework of tools that can be deployed as needed rather than a single system for every condition and every outbreak management strategy.

See Case Study 20 for more details about ongoing system development to ensure NSW Health can continue to respond to communicable diseases, both current and emerging.

Implementing information systems that allowed rapid communication with large groups of people was key to supporting the public health response

Systems like Whispir gave NSW Health the ability to respond to situations quickly, thereby reducing the chance of onwards transmission. They also allowed response teams to stay in contact with people directly impacted by COVID-19. Contacts reported that this communication gave them confidence in NSW Health and helped them feel supported during what could be a very difficult time. Using systems to support this high-volume work also allowed the response to leverage available staff for maximum impact.

Integration between statewide and diverse local systems was sometimes a challenge

Systems were often built with a centralised/Ministry perspective. The diversity in information systems and processes across LHDs is a challenge when integrating a statewide system. Local staff reported that some Ministry-designed systems did not fit with their existing processes but had to be used to facilitate collaboration. It is necessary to take a holistic view across the network to ensure systems meet the needs of both local and central teams.

Information systems require training and experience to use them effectively

To achieve optimal utility, staff need to be trained in the use of information systems. Doing this in a timely manner, particularly in periods of surge, was reported as a challenge across the pandemic. Some people were not skilled in all functions of existing systems, so the systems were not used to maximum value. New systems required training for all staff using them, often in moments of high workload. Maintaining competency in key functionality and preparing for system use under non-pandemic conditions will support the use of systems under crisis conditions. NSW Health needs to build capacity in systems and in people to use them before an emergency occurs.

Relationships with Ministry and pillar partners were critical to rapid system integration

Relationships with eHealth NSW, SHEOC and the Ministry's Patient Experience and System Performance Division were key to achieving the rapid development and implementation of supporting systems.

These working relationships were not always embedded in standard ways of working before the pandemic. COVID-19 required the breakdown of organisational silos to achieve significant pieces of work.

It is important that HPNSW continue to build ways to work closely with these teams to develop integrated systems that can support the public and clinical health needs of the NSW community.

CASE STUDY 20

Investment in surveillance tools: the SIGNAL program

The Notifiable Conditions Information Management System (NCIMS) is the foundational system used by local health districts and Health Protection NSW to support the COVID-19 pandemic response, as well as other routinely notifiable conditions. As the pandemic progressed, the volume of data processed by and collected in NCIMS increased exponentially and the system was tested at critical points. Rapid design and development of tactical COVID-specific systems and significant infrastructure scale-up was required to maintain core functionality of the system, but it was clear that significant investment was needed to future proof the routine notifiable conditions system.

A program of work to transform surveillance and response capabilities was approved in May 2021. The vision of the SIGNAL program is a NSW Health system that is integrated and digitally enabled to respond rapidly and effectively to communicable diseases and events of public health significance. Over the next three years, work will be undertaken to develop enhanced and automated systems that can support the response to large-scale public health threats focused on:

- rapid and more accurate disease surveillance and outbreak response capabilities
- ability to flex rapidly and ensure a timely response to large-scale public health threats
- public health decision making
- informed decision making through access to rapid operational metrics
- optimised outbreak response times through improved automation of current systems and processes
- coordinated and scalable response
- ability to integrate relevant complex data to support timely decision making
- appropriate resourcing and a skilled workforce
- the experience of the NSW population
- timely, personalised communications with people at risk
- timely and targeted communications to the community.

This work will be undertaken in partnership with eHealth NSW to ensure the implementation of technical solutions can be achieved in a model that fits with the organisational structures and requirements of Health Protection NSW.

While NSW has strong disease surveillance systems to respond to outbreaks, the overwhelming scale and breadth of the public health response to COVID-19 highlighted gaps in the system, as well as highlighted opportunities for how BAU responses could be enhanced. To support and maintain public health response capacity, it is important to invest in people and technology to streamline and integrate systems and processes that can be scaled as and when required.

Recommendations

Now

5.5.1 Review information technologies used during the pandemic and determine their utility for ongoing pandemic response and broader outbreak management in conjunction with eHealth NSW and as part of the new NCIMS Platform Continuous Improvement Design Working Group.

5.5.2 Strengthen surveillance and outbreak management platforms in NSW and continue investment in the development and implementation of the new SIGNAL system as a replacement for NCIMS.

5.5.3 Maintain and strengthen relationships with key technical and subject matter experts outside the Population and Public Health Division, including eHealth NSW and academic partners, in the refinement and development of new information technology systems.

5.5.4 Provide ongoing training and competency attainment in existing information systems as this is critical to ongoing pandemic and outbreak management across the public health network.

Near future

5.5.5 Strengthen clear governance structures for development and refinement of health protection data and information systems and ensure strong policy engagement with the program of work.

5.5.6 Review ongoing call centre requirements in light of existing statewide and Commonwealth Government call centre capabilities and identify an approach to surge and manage high volume inbound calls from the community while ensuring technical skills and key personnel to stand up the system.

5.5.7 Pilot Public Health Rapid, Emergency, Disease and Syndromic Surveillance (PHREDSS) sourcing rapid emergency department data from the Patient Flow Portal Operational Data Store to synthesise public health surveillance and clinical service utilisation data.

5.5.8 Continue to monitor the market for innovative approaches and tools to support core functions of HPNSW and take a user-centred design approach (e.g. alternative tools and mechanisms to communicate with people at-scale in a coordinated way).

Future pandemics

5.5.9 When developing information systems in future public health emergencies, note the importance of co-designing processes that consider operational requirements and capacity across the Ministry, pillar agencies and LHDs.

Reference

Pan American Health Organization (PAHO) 2020, *COVID-19 and the importance of strengthening Information Systems*, World Health Organization Regional Office for the Americas, Washington, D.C, <https://iris.paho.org/handle/10665.2/52127>.

Table 1: Major technology platforms used to support PHRB and the COVID-19 response

System name	New or existing	Purpose
Surveillance platforms		
NCIMS	Existing	Surveillance and management of notifiable conditions in NSW
NEGCOV	New (implemented Sept 2021)	Surveillance and management of negative COVID-19 results. Implemented to reduce burden on NCIMS
PHREDSS	Existing	Provides near real-time intelligence on public health issues using emergency department and ambulance call data
Patient Flow Portal	Existing, integration with NCIMS new (implemented mid 2020)	Monitoring bed allocations and patient details in NSW public hospitals
Case, contact and management platforms		
CCAS (ServiceNow)	New (implemented Sept 2021)	Allocating and conducting case interviews
CCON (ServiceNow)	New (implemented Nov 2021)	Allocating and conducting contact interviews; sending messages to contacts
TRACIE (Genesys and cStar)	New (developed Oct 2020 to Feb 2021)	Call centre system for the central contact tracing team to support telephony and contact management activities
Venue Tracker – Excel	New (implemented early 2020)	Recording exposure venue details to inform public and support outbreak management
Venue Tracker – Microsoft Dynamics	New (implemented Sept 2021)	More sophisticated system for recording exposure venue details to inform public and support outbreak management, and to manage risk assessment workflows
Case, contact and community communication platforms		
Prodocom	Existing	Mass text message system used to communicate with contacts
Whispir	New (implemented May 2020)	Text message system integrated with NCIMS to send information and surveys to monitor wellbeing of contacts and to triage cases
Cascade mobile phones	Existing	Mobile phone lines to support multiple inbound calls simultaneously
Avaya	Existing	Softphone system used for outbound and small volume inbound calls
Genesys	New (implemented Feb 2021)	Call centre software to facilitate large call volumes
Information management and collaboration platforms		
Trello	Existing	Online collaborative workspace, primarily used for handovers between shifts
Microsoft Teams and SharePoint	Existing	Online collaborative workspace, primarily used for sharing documents and spreadsheets within teams and across the public health network

5.6

Research

Agile research infrastructure that facilitates rapid research production and knowledge dissemination is a powerful tool in response to a public health emergency such as the COVID-19 pandemic (Hanney 2021). To effectively control and manage COVID-19 requires knowledge gaps to be rapidly filled across various fields, including basic sciences, clinical sciences, public health, implementation science, and policy and system studies (Henderson et al. 2022).

The context

Starting in April 2020, the NSW Government dedicated $25 million (later increasing to $28 million) to research that supported the NSW COVID-19 response and recovery. As a result, the NSW Health COVID-19 Research Program was established to contribute knowledge to minimise the health and social impacts of the COVID-19 pandemic in NSW. Investment in the program was supplemented by existing research funding and newly established funding sources.

The NSW Health COVID-19 Research Program consists of eight interconnected workstreams.

The **Research Funding Schemes** fund research projects in priority areas to directly support the NSW Health COVID-19 pandemic response and recovery:

- *COVID-19 Research Grants* – two rounds of competitive funding. Seven targeted studies were funded in Round 1 and 10 studies were funded in Round 2. Round 1 had short application and scientific review timeframes and was designed for projects that were ready to start within four weeks of funding, with preliminary data available within six months to support the short-term needs of the pandemic response. It covered diagnostics research, prevention of infection, treatment, and public and population health. Round 2 provided slightly longer timeframes and was designed to support the medium-and long-term needs of the response and recovery. Round 2 priorities covered identification of effective models of care, mental health impacts of COVID-19, public health messaging, prevention and therapeutics, and diagnostics.
- *Emergency Response Priority Research (ERPR) workstream* – enabled rapid creation of evidence to support urgent operational work for the public health management of the COVID-19 pandemic in NSW. This workstream leveraged existing research infrastructure and partnerships to rapidly generate local evidence to inform policy and practice throughout the pandemic. A key mechanism to achieve this has been embedding research personnel in the response to work directly with key policy decision makers and frontline workers within NSW Health and leveraging Health datasets to inform the pandemic response. As of June 2022, the ERPR workstream consisted of 12 funded research projects across a range of priority areas (a full list of projects is provided in Appendix C). Importantly, many of these projects directly engaged LHDs in their development and implementation.
- *Vaccine Research Support workstream* – involved establishment and funding of the Vaccine, Infection and Immunology Collaborative Research Group to study clinical and immunological responses to COVID-19 vaccines, and the NSW RNA Production and Research Network to support development of new RNA vaccines and research.

The **Enhancement of the Research Ecosystem and Infrastructure** theme connects three workstreams aimed at strengthening the NSW research landscape and infrastructure in response to COVID-19:

- *Clinical Trials workstream* – developed infrastructure to build capacity in NSW to conduct adaptive clinical trials for the treatment of COVID-19, while linking NSW researchers to a global network of experts. Several networks and advisory groups have been established to provide expert advice.
- *Expediting Statewide Administrative Processes workstream* – minimised unnecessary delays in approvals for research ethics applications and site-specific assessments for COVID-related research, as well as monitoring the impact the pandemic had on approval numbers and times for non-COVID-related research.
- *Industry Schemes workstream* – assisted medical device businesses funded through the Medical Devices Fund to remain viable during the pandemic to contribute to a sustained infrastructure and the NSW recovery. The workstream also enabled commercialisation of therapeutics and devices for COVID-19.

The **Enabling Research Translation** theme expedites translation from the funded research into the COVID-19 pandemic response and recovery through two workstreams:

- *Rapid Translation and Impact Assessment workstream* – conducted rapid research synthesis of program outputs and targeted dissemination to key decision makers as required and facilitates the evaluation of the program.

- *Communications workstream* – conducted communication activities enabling research outcomes to be shared publicly, including through the NSW Health and Medical Research website and social media accounts, such as the @NSWMedResearch Twitter account.

At the same time, the Ministry extended the funding period for the NSW Prevention Research Support Program (PRSP) by a further 12 months to allow scheme recipients to contribute to the response where appropriate. To illustrate, using PRSP funding and COVID-19 Research Grant funding, the Centre for Infectious Diseases and Microbiology-Public Health investigators redeployed their research program to work on COVID-19 preparedness and response, including enhanced genomic tracking of COVID-19 importations and transmissions in NSW. The Kirby Institute engaged in a range of research activities critical to the response, including serosurveillance for SARS-CoV-2 infection, the COVID-19 NSW Outcomes Study, and various modelling and surveillance projects.

Concurrently, in early 2020 the Agency for Clinical Innovation created the Critical Intelligence Unit (CIU) which brought together clinical, analytic, research, organisational and policy experts to provide timely and considered advice to decision makers (CIU 2022). It played a complementary role to frontline pandemic response teams, providing real-time, synthesised advice and options to be considered by system leaders. It also maintained communities of practice that facilitated engagement between the research sector and policy teams. Of particular use to the public health response were the living reviews maintained by the CIU in the areas of COVID-19 vaccines, SARS-CoV-2 variants, post-acute sequelae (long COVID), surgery and COVID-19, and COVID-19 rapid testing.

In addition, local research was conducted across LHDs on various aspects of the response, with LHD staff publishing case studies of outbreaks, studies of transmission risk and evaluations of contact tracing tools (Dalton et al. 2020; Katelaris et al. 2021; Vogt et al. 2022). There was less visibility of this research centrally and often these studies were brought to the attention of the Ministry through fora such as the HPLT. The PHRB Epidemiology and Surveillance Team attempted to develop a more complete view of research occurring across the public health network in 2021, but the Delta wave paused this process.

The work of the CIU complemented the NSW Health COVID-19 Research Program, PRSP funding, local research, and research and epidemiological support provided by CEE to the NSW public health response.

Key learnings and achievements

The translation of COVID-19 research into NSW pandemic response decision making was a success by international standards

Hanney et al (2022) collated evidence on research generation and use in pandemic responses in seven countries: Australia, Brazil, Canada, Germany, New Zealand, the United Kingdom and the United States. The study notes significant achievements in research generation and translation in NSW during the pandemic that were built on long-term investment in applied research, research strategy and research-practice partnerships.

The COVID-19 pandemic presented three key research challenges: asking the right research questions; how to rapidly appraise and synthesise international and local evidence; and, arguably the most important, how to rapidly apply this evidence to inform government, public health and clinical decision making. The reorientation of existing funding schemes such as the PRSP, new COVID-19 research funding, and the creation of the CIU were important steps in addressing some of these challenges in the NSW context. Collectively, these investments resulted in some outstanding examples of rapid research translation by international standards, as outlined in Case Studies 21 and 22 (Hanney et al. 2022).

The NSW Health COVID-19 Research Program largely achieved its key objectives

An interim impact evaluation of the program conducted by CEE in 2021 concluded that it largely achieved its key objective of establishing a pathway to create knowledge and innovations to support the COVID-19 pandemic response (CEE 2021). The impact assessment also concluded that there were demonstrated impacts across all five domains of benefit: knowledge generation; influence on policy and practice; contributing to better clinical care; community and health outcomes; and economic benefits (CEE 2021).

The Emergency Response Priority Research workstream resulted in rapid translation

The ERPR workstream was found to be particularly successful in enabling rapid generation of local evidence that directly informed various elements of the NSW public health response to COVID-19. The agile response of highly skilled and experienced researchers working in close partnership with policy makers ensured health decision makers had the best possible locally-generated evidence on which to base operational decisions across various areas, including transmission in schools, vaccine effectiveness, health workers, wastewater surveillance, COVID-19 outcomes and COVID-19 seroprevalence.

An example of rapid translation from early in the pandemic funded under this workstream is the rapid serosurveillance of SARS-CoV-2 in Sydney and NSW. This involved large-scale serological testing of residual specimens from blood tests and donations to establish the presence of SARS-CoV-2 antibodies in the population. This work also formed part of the national seroprevalence survey with the Australian Partnership for Preparedness Research on Infectious Disease Emergencies (APPRISE) network. Analysis of 5,375 Sydney specimens by the Institute of Clinical Pathology and Medical Research estimated SARS-CoV-2 seroprevalence to be below 1%, indicating that community transmission was low during the first COVID-19 epidemic wave in Sydney (Gidding et al. 2021).

Another notable example of rapid translation funded under the ERPR workstream was a collaboration of NSW Health, Sydney Water, Water Research Australia's Australia-wide Collaboration on Sewage Surveillance of SARS-CoV-2 (ColoSSoS) and the University of NSW to validate a novel method for detecting SARS-CoV-2 fragments in wastewater (Camphor et al. 2022) (see Case Study 21).

A more recent example of rapid translation funded under the ERPR workstream is the NSW vaccine effectiveness study, a partnership between NCIRS and NSW Health to assess vaccine effectiveness in the NSW population using linked routinely collected SARS-CoV-2 surveillance data (see Case Study 22).

Leveraging existing relationships and investment to rapidly deploy research on policy priorities was critical in research informing decision making in the public health response

The success of the ERPR projects highlights the value of a strong, collaborative health research sector, and the importance of a well-trained public health research community and adequately skilled and qualified public health workforce (Campbell et al. 2021). More detailed descriptions of translation through the ERPR workstream are provided in a paper prepared by CEE and published in 2021 (Campbell et al. 2021).

NSW Health has not been alone in recognising the potential of rapidly leveraging existing research infrastructure and partnerships. In the United Kingdom, the National Institute for Health Oxford Biomedical Research Centre reallocated research funding at the beginning of the pandemic to 'pump-prime' emerging high-impact COVID-related research. This included the Oxford/AstraZeneca COVID-19 vaccine and the RECOVERY trial, one of the first studies examining the effectiveness of COVID-19 treatments in the world (University of Oxford 2020; University of Oxford 2022).

Embedding academic partners into the public health response was an important enabler of research and workforce surge

Embedding research personnel in the pandemic response to work directly with key policy decision makers and frontline workers within NSW Health was a highly effective research translation strategy and an important workforce surge mechanism for building the epidemiological capacity of the public health response.

Engaging clinical advisory groups was an important enabler of research engagement and translation

Advisory groups such as the Research Intelligence Group and Clinical Intelligence Group were a vital interface between the research sector and public health and health system responses. The CIU provided useful living review updates on the international literature regarding vaccine effectiveness, variants, COVID-19 transmission and long COVID.

CASE STUDY 21
COVID-19 wastewater monitoring

Early in the COVID-19 pandemic it was established that fragments of the COVID-19 (SARS-CoV-2) virus could be detected in untreated sewage, providing an opportunity to track infections in the community alongside existing testing efforts (Mallapaty 2020).

The wastewater monitoring project rapidly pivoted existing technology to verify the sensitivity and specificity of the approach of detecting SARS-CoV-2 fragments in wastewater. Additional funding was subsequently provided by NSW Health to operationalise the method and establish a statewide COVID-19 wastewater surveillance program.

A microbiological sampling procedure and checklist for COVID-19 sewage surveillance were produced, and technical knowledge, including methods and protocols, was shared internationally (The Water Research Foundation 2020). Methods validated through the wastewater testing pilot were incorporated into the NSW Sewage Surveillance Program, which provided critical intelligence via reporting of test results to NSW Health, other state and territory jurisdictions and the Australian Government, as well as to the public via the NSW Health website (HPNSW 2022).

Findings from the Surveillance Program have enabled NSW Health to target messaging and testing to high-risk areas, tracking possible COVID-19 clusters and outbreaks and managing movement restrictions following a known outbreak. For example, in the Northern Beaches region (an outer-suburban area of metropolitan Sydney), COVID-19 viral fragments were detected in sewage on 16 December 2020, the same day as two confirmed clinical cases of COVID-19 in the area. The specificity of the data contributed to the Northern Beaches being segmented into upper and lower regions, with stricter restrictions in the upper region, including limited movement out of the area. Continued monitoring of COVID-19 detections in sewage also informed subsequent easing of restrictions in the lower region.

References

Mallapaty S 2020, 'How sewage could reveal true scale of coronavirus outbreak', *Nature*, vol. 580, no. 7802, pp. 176-177, DOI:10.1038/d41586-020-00973-x.

Health Protection NSW (HPNSW) 2022, *COVID-19 Sewage Surveillance Program website*, NSW Health, accessed 24 August 2022, <www.health.nsw.gov.au/Infectious/covid-19/Pages/sewage-surveillance.aspx>.

The Water Research Foundation 2020, *Wastewater surveillance of the COVID-19 genetic signal in sewersheds: recommendations from global experts*, The Water Research Foundation, Virginia, accessed 8 July 2021, <www.waterrf.org/sites/default/files/file/2020-06/COVID-19_SummitHandout-v3b.pdf>.

Research impact assessment is an important tool to determine policy and practice impacts and value for money

The excellent examples of translation identified in NSW-funded COVID-19 research highlight the value of research impact assessment methods as tools to understand policy and practice impacts of research and return on investment, and to inform future funding approaches.

A key strength of the NSW approach was engagement of senior public health and health system representatives in identification of research priorities and the rapid deployment of research funding

A key strength of the approach to COVID-19 research funding in NSW was the integration of government decision makers into processes for identification of research priorities and in the shortlisting of research funding to ensure that research funded met policy and practice needs. The rapid pace of the allocation of research funding through both existing research partnerships and competitive funding streams was another key strength.

Research translation achieved in the pandemic was built on a long-term investment in 'research ready' environments in population health in NSW

It is important to recognise that the substantial achievements in research translation achieved in NSW during the pandemic were built on 20 years of investment in 'research ready' environments in population health. The Population and Public Health Division has released two iterations of a Population Health Research Strategy (NSW Department of Health 2010; CEE 2019) which outline its vision for population health research. It has also invested in a comprehensive population health research pipeline that includes investment in research assets such as the Centre for Health Record Linkage (CHeReL

CASE STUDY 22
NSW vaccine effectiveness study

Ongoing assessment of COVID-19 vaccine effectiveness (VE) provides real-world evidence about the level of protection vaccination schedules offer against disease. Findings have informed vaccination policy in the context of an evolving pandemic and changing SARS-CoV-2 variants and supported public health messaging to maintain community confidence in the vaccination program.

This collaboration between the National Centre for Immunisation Research and Surveillance and NSW Health (Public Health Response Branch and the Centre for Epidemiology and Evidence) aimed to assess VE in the NSW population using linked routinely collected SARS-CoV-2 surveillance data. Five assessments were undertaken using different methods (Liu et al. 2022).

- Study 1 found that during the SARS-CoV-2 Delta wave, rates of infection were over 10-fold higher and intensive care unit admissions or deaths were more than 16-fold higher in the unvaccinated population compared with 2-dose vaccine recipients (≥12 years).
- Study 2 estimated VE of 72.8% (95% CI 76.1–82.1) against infection for 2-dose vaccine recipients (≥16 years) early in the Delta wave.
- Study 3, conducted over the entire Delta outbreak period (June-November 2021), estimated VE against hospitalisation in people aged ≥18 years (89.8%; 95% CI 88.8–90.7 at 14 or more days after dose 2).
- Study 4 reassessed VE following the emergence of Omicron due to its immune escape properties. Attack rates of >50% were reported in two indoor entertainment venue outbreaks where >95% of attendees had received 2 doses (an average of 2 months prior).
- Study 5 reported rapid waning of 2-dose VE against Omicron infection and, to a lesser extent, waning against hospitalisation/death in people aged ≥40 years. However, with a third dose effectiveness against infection was restored and protection against severe disease enhanced: compared to recent (<90 days) 2-dose vaccine recipients the relative VE for dose 3 was 7% (95% CI 5–9%) against infection and 65% (95% CI 61–69%) against hospitalisation/death.

This work provided the first estimates of VE in an Australian population using real-world data for NSW. Findings have informed state and Commonwealth policies about the need for, and timing of, the third dose booster and the importance of maintaining other public health measures. Outputs were presented to national disease control and vaccination policy committees and three reports were released publicly, with associated media and health communications. The work highlights the value of a routinely updated linked data resource to enable timely, ongoing vaccine program evaluations as population immunity and COVID-19 epidemiology changes.

Reference

Liu B, Gidding H, Stepien S et al 2022, 'Relative effectiveness of COVID-19 vaccination with 3 compared to 2 doses against SARS-CoV-2 B.1.1.529 (Omicron) among an Australian population with low prior rates of SARS-CoV-2 infection', *Lancet* (preprint), DOI: http://dx.doi.org/10.2139/ssrn.4142075.

2022); priority research centres (e.g. BBV & STI Research, Intervention and Strategic Evaluation Program) (The Kirby Institute 2022); competitive funding schemes such as the NSW Translational Research Grants Scheme (NSW Ministry of Health 2022), NSW Prevention Research Support Program (CEE 2022), Early-Mid Career Fellowships and PhD programs; collaborative research that leverages national funding schemes (partnership grants, centres of research excellence and partnership centres); and comprehensive evaluations of policies and programs. Furthermore, it has also invested in important enablers, including population health training programs and NSW Health population health networks. Leveraging the partnerships and connections fostered prior to the pandemic enabled rapid translation of research evidence in NSW during the pandemic.

Recommendations

Now

5.6.1 Continue to use clinical advisory groups as tools to engage policy makers and the research sector in identification of research priorities.

5.6.2 Identify key lessons learned about research translation from the pandemic and incorporate into BAU.

Near future

5.6.3 Develop a collection of COVID-19 public health research conducted across the public health network during the pandemic, including local research and projects funded through NSW Health funding schemes, and consider key implications of the research for practice.

5.6.4 Conduct an impact assessment and evaluation of the research competitively funded through the $28m COVID-19 response and recovery investment at the completion of the funding period in June 2023.

Future pandemics

5.6.5 Leverage existing research infrastructure and partnerships and fund direct engagement of leading researchers to rapidly generate policy-relevant evidence and assess proposals through a rapid emergency response assessment panel.

5.6.6 Embed research staff into response epidemiology and surveillance functions to facilitate research translation and improve workforce capacity and surge.

References

Campbell D, Edwards B, Milat A et al 2021, 'NSW Health COVID-19 Emergency Response Priority Research program: a case study of rapid translation of research into health decision making', *Public Health Res Pract*, vol. 31, no. 4, DOI: 10.17061/phrp3142124.

Camphor HS, Nielsen S, Bradford-Hartke Z et al 2022, 'Retrospective epidemiological analysis of SARS-CoV-2 wastewater surveillance and case notifications data – New South Wales, Australia, 2020', *J Water Health*, vol. 20, no. 1, pp. 103-13, DOI:10.2166/wh.2021.275.

Centre for Epidemiology and Evidence (CEE) 2019, *Population Health Research Strategy 2018-2022*, NSW Ministry of Health, Sydney, accessed 29 July 2022, <https://www.health.nsw.gov.au/research/Pages/research-strategy-2018-2022.aspx>.

Centre for Epidemiology and Evidence (CEE) 2021, *NSW Health COVID-19 Research Program Impact Evaluation Report 2021*, accessed 29 July 2022, NSW Ministry of Health, Sydney, <www.health.nsw.gov.au/research/Pages/covid-impact-evaluation-interim.aspx>.

Centre for Epidemiology and Evidence (CEE) 2022, *Prevention Research Support Program website*, NSW Health, accessed 29 July 2022, <www.health.nsw.gov.au/research/Pages/prsp.aspx>.

Centre for Health Record Linkage (CHeReL) 2022, *Centre for Health Record Linkage website*, NSW Health, accessed 29 July 2022, <https://www.cherel.org.au/>.

Critical Intelligence Unit (CIU) 2022, *COVID-19 Critical Intelligence Unit website*, Agency for Clinical Innovation, NSW Health, accessed 4 July 2022, <https://aci.health.nsw.gov.au/covid-19/critical-intelligence-unit>.

Dalton CB, Corbett SJ, Katelaris AL 2020, 'COVID-19: implementing sustainable low cost physical distancing and enhanced hygiene', *Med J Aust*, vol. 212, no. 10, pp. 443-6, DOI: 10.5694/mja2.50602.

Gidding HF, Machalek DA, Hendry AJ et al 2021, 'Seroprevalence of SARS-CoV-2-specific antibodies in Sydney after the first epidemic wave of 2020', *Med J Aust*, vol. 214, no. 4, pp. 179-185, DOI: 10.5694/mja2.50940.

Hanney SR 2021, 'Building research infrastructure across a health service', *CMAJ*, vol. 193, no. 9, pp. E315, DOI: 10.1503/cmaj.77958.

Hanney SR, Straus SE, Holmes BJ 2022, 'Saving millions of lives but some resources squandered: emerging lessons from health research system pandemic achievements and challenges', *Health Res Policy Syst*, vol. 20, no. 99, DOI:10.1186/s12961-022-00883-6.

Henderson L, McShane H, Kiparoglou V 2022, 'Rapid research response to the COVID-19 pandemic: perspectives from a National Institute for Health Biomedical Research Centre', *Health Res Policy Syst*, vol. 20, no. 24, DOI: 10.1186/s12961-022-00827-0.

Katelaris AL, Wells J, Clark P et al 2021, 'Epidemiologic evidence for airborne transmission of SARS-CoV-2 during church singing, Australia, 2020', *Emerg Infect Dis*, vol. 27, no. 6, pp. 1677-80, DOI: 10.3201/eid2706.210465.

NSW Department of Health 2010, *Promoting the generation and effective use of population health research in NSW: A Strategy for NSW Health 2011-2015*, NSW Department of Health, Sydney, <www.health.nsw.gov.au/research/Publications/pop-health-res-strat.pdf>.

NSW Ministry of Health 2022, *Translational Research Grants Scheme website*, NSW Health, accessed 29 July 2022, <www.medicalresearch.nsw.gov.au/translational-research-grants-scheme/>.

The Kirby Institute 2022, *BBV & STI Research, Intervention and Strategic Evaluation Program (BRISE)-ASP website*, UNSW, accessed 24 August 2022, <https://kirby.unsw.edu.au/project/brise-asp>.

University of Oxford 2020, *COVID 19 Oxford Vaccine Trial website*, University of Oxford, accessed 4 July 2022, <https://covid19vaccinetrial.co.uk/>.

University of Oxford 2022, *RECOVERY Randomised Evaluation of COVID-19 Therapy website*, University of Oxford, accessed 4 July 2022, <www.recoverytrial.net/>.

Vogt F, Haire B, Selvey L et al 2022, 'Effectiveness evaluation of digital contact tracing for COVID-19 in New South Wales, Australia', *The Lancet Public Health*, vol. 7, no. 3, pp. e250-e258, DOI: 10.1016/S2468-2667(22)00010-X.

6 How population health services adapted to COVID-19

COVID-19 has left no healthcare system untouched. The COVID-19 pandemic resulted in a systemic interruption of the delivery of many population-based programs and a disruption of the workforce for these programs (Crane et al. 2022). In NSW, pandemic preparedness and surge of COVID-19 cases has resulted in widespread deferment of scheduled medical procedures and appointments (Sutherland et al. 2020). Patterns of healthcare-seeking behaviour changed across the pandemic, with a reluctance by many to visit healthcare settings. As an example, NSW primary care face-to-face consultations between March and June 2020 decreased by 22.1% and breast screening activity decreased by 51.5%, compared to the same period the previous year (Sutherland et al. 2020). While participation in the BreastScreen NSW program was significantly impacted by the COVID-19 pandemic due to temporary closures in 2020, and again in 2021, activity levels have returned to pre pandemic levels and participation rates are increasing. This caution extended to community settings where many population health services and programs are delivered (AIHW 2022).

It was not feasible to cover the full impact of COVID-19 on all NSW population health services in the debrief process as population health covers broad policy and program areas. Rather, this chapter provides an overview and illustrative examples of how a limited number of health protection, preventive health, oral health, and drug and alcohol services were impacted; outlines how associated delivery systems responded and adapted; and offers lessons learned to inform future population health service delivery. Illustrative examples of impacts on services and programs were drawn from four centres within the NSW Ministry of Health:

- **Health Protection NSW (HPNSW)**: responsible for surveillance and public health response in NSW, including monitoring the incidence of notifiable infectious diseases and taking appropriate action to control the spread of diseases. It also provides public health advice and response to environmental issues affecting human health.
- **Centre for Population Health (CPH)**: responsible for preventive health initiatives to improve health and reduce the burden of chronic disease, covering the areas of healthy eating and active living, tobacco control, bloodborne viruses and sexually transmissible infections.
- **Centre for Oral Health Strategy**: responsible for population health-based oral health prevention initiatives and public oral health service delivery in NSW.
- **Centre for Alcohol and Other Drugs**: responsible for alcohol and drug-related prevention, early intervention, harm minimisation initiatives and treatment services.

Population health services managed by these centres are delivered through a mix of LHDs, NGOs and ACCHS, or in collaboration with other NSW Government agencies or private providers.

The context

Population health workforce deployment and contribution to the public health response

The population health workforce (health promotion, sexual health, hepatitis and HIV, oral health, drug and alcohol, and HPNSW) was widely deployed to support the public health response centrally and locally. This workforce was critical for increasing surge capacity and made up a large proportion of the public health response workforce at various stages of the pandemic, as described in Chapter 5.2 (*Workforce capability and surge capacity*). In particular, the health promotion workforce was deployed to the local public health response for sustained periods. Local pandemic activity and LHD workforce needs influenced workforce deployments. When and how long staff from various services were deployed therefore varied by LHD. Deployment of Ministry staff also varied across centres, units within centres, and by pandemic stage.

Population health staff were deployed to public health response roles, including contact tracing, case management, assisting with testing activities, and business compliance audits. Respondents reported that in some instances staff already had skills in these areas. For example, sexual health service staff were often familiar with contact tracing through managing sexually transmissible infections. Similarly, tobacco compliance officers had experience conducting business audits. In other instances, staff were unfamiliar with their deployment roles, needed to learn new skills, and were required to work outside their usual professional support networks. Deployments also occurred to support other health service priorities, such as telehealth implementation, surge recruitment of clinical and ancillary staff, and vaccination programs, in some LHDs.

As well as filling roles within the public health response, population health staff made direct contributions to the response by developing solutions to emerging problems. To illustrate, Case Study 23 describes how CPH rapidly established a COVID-19 Information Call Centre to help field COVID-19 enquiries from the public in the early phases of the pandemic until the function transitioned to Service NSW. Another example was a collaboration with the Centre for Aboriginal Health to engage pharmacies and general practices to prioritise and promote COVID-19 vaccinations for Aboriginal people. Here, CPH staff with clinical and general practice backgrounds, marketing skills, and experience working with Aboriginal people, helped to develop awareness and education materials for distribution to pharmacies and general practices. At a local level, respondents described how population health staff contributed to the development of resources and facilitated engagement with CALD communities (see Case Study 9 in Chapter 4.2). They also provided COVID-19 information, COVID-19 testing and vaccination services to hard-to-reach and vulnerable population groups (e.g. people who are alcohol and drug dependent, sex workers).

Suspension and reduction of services for COVID-related reasons

Respondents reported that population health services and programs were suspended, operated at reduced capacity, or with substantial modifications at various points throughout the pandemic. Local implementation of prevention initiatives was particularly impacted (e.g. healthy eating and active living programs in schools and childcare settings, group-based healthy lifestyle programs, and local tobacco compliance activities), with some statewide projects put on hold. In addition, the Primary School Mobile Dental Program did not operate for extended periods. Screening and treatment services for individuals (e.g. public dental services, the Opioid Treatment Program (OTP), drug and alcohol rehabilitation services, sexual health clinics) were available in some capacity throughout the pandemic, although modified for client and staff safety. This was also the case for the Needle and Syringe Program (NSP). These services were prioritised for delivery as service users face more immediate health risks without intervention. Private and non-government sector support was sought, in some instances, due to public sector workforce capacity constraints.

Where repeated service closure and reopening occurred, this led to longer reactivation times but also offered opportunities for innovation in service delivery.

At a state level, policy development and support for communities of practice and leadership forums continued for most policy areas, albeit at a slower pace and within staffing capacity.

Several COVID-related factors influenced service delivery, including:

- reduced workforce capacity due to staff deployment and absence due to illness and isolation/quarantine requirements
- concerns for client and staff safety (e.g. face-to-face group-based programs for older adults were suspended between February 2020 and January 2021 due to concerns about the risks of severe COVID-19 illness among this target group, and emergency dental care was prioritised at some stages of the pandemic due to concerns about staff safety from aerosol generation during treatment)
- reduced capacity of program partners to participate in prevention programs (e.g. schools, childcare services, and health service facilities were affected by stay-at-home orders, workforce capacity constraints and shifting COVID-related priorities throughout the pandemic)
- COVID-19 restrictions and safety measures (e.g. access to venues and sites to undertake delivery was limited at some stages of the pandemic; working from home requirements similarly impacted site visits and in-person contact with clients; and physical distancing requirements reduced the number of clients that could be seen at clinics and other facilities).

Service adaptation and innovation

The pandemic resulted in significant re-orientation and adaptation of services to ensure ongoing service availability. This included changes to the modality and nature of service delivery, including the accelerated adoption of virtual and hybrid service delivery models. Service adaptations included:

- using telehealth (telephone and virtual care consultations) to provide care to clients
- using online platforms and telephone coaching to deliver healthy lifestyle programs

CASE STUDY 23
Rapid establishment of the COVID-19 Information Call Centre by the Centre for Population Health, NSW Ministry of Health

As COVID-19 cases emerged in NSW calls to the Ministry's reception increased rapidly, with people wanting to know what the virus and possible restrictions meant for them. There was no identified area or team that these calls could be transferred to. At that time, if NSW Health was Googled the Ministry reception phone number was the first contact number the public encountered.

On 29 January 2020, the COVID-19 Information Call Centre was established by the Centre for Population Health (CPH), within two hours of a request from the Chief Health Officer to assist in handling calls from the public. The call centre operated Monday to Friday from 8am to 5pm and was initially staffed by a team of five CPH staff; this swelled to a pool of almost 30 staff, with an average of 8-10 staff working per shift. The call centre was staffed by volunteers from a range of professional disciplines and backgrounds from across CPH, and later included staff from across the Ministry and additional staff sourced from other agencies via the Public Service Commission.

Very few staff were experienced in working in a call centre. Key challenges centred around dealing with difficult customers and calls in such high volumes that it was often difficult to respond to them all. Between 29 January and 14 July 2020, the call centre handled 17,194 calls, with the daily peak on 23 March of over 407. The most common queries related to exemptions from public health orders, business/employment, social gatherings/movement, access to PPE, and laboratory testing.

Several months into its operation it became clear that a more sustainable and efficient business model was required. Service NSW had established a COVID Call Centre which received mainly business and travel-related calls (60% of calls to the Ministry call centre). Following negotiations between the Public Health Emergency Operations Centre, State Health Emergency Operations Centre and Service NSW, these call centre functions were taken over by Service NSW on 14 July 2020, using trained call centre staff.

The rapid stand up of the call centre showed the agility with which population health staff were deployed to support the pandemic response and the willingness of staff to make a positive contribution to the response despite the challenges.

- increasing the availability of online information for clients, service providers and the public
- using postal services to provide information, medication and equipment (e.g. injecting equipment)
- introducing home visiting and outreach services for clients requiring treatment while isolating (e.g. door-to-door visits to assist people experiencing unplanned drug and alcohol withdrawal during apartment lockdowns in Sydney)
- increasing service access points by engaging other community providers (e.g. pharmacies for OTP clients)
- helping clients reach services when movement orders were in place (e.g. providing travel permissions ('Essential Service' cards))
- changing medication prescribing practices (e.g. rollout of longer acting opioid treatment medications, electronic prescriptions for dental pain relief)
- using video conferencing platforms to engage with and train service providers and delivery partners
- establishing communities of practice and online engagement forums where these did not previously exist (e.g. oral health community of practice)
- changing clinic procedures to accommodate COVID-19 restrictions and safety requirements (e.g. screening procedures, reduced appointment times and increased gaps between appointments)
- developing business continuity plans, risk matrices, prioritisation procedures and COVID-safe plans

- supporting service providers to put COVID-19 safety requirements in place (e.g. ensuring compliance with health staff vaccination requirements, providing help with accessing PPE, screening tests and infection control training).

Case Studies 24, 25, 26 and 27 provide examples of specific service innovations, including the introduction of teledentistry services in Western NSW; re-orienting the OTP to meet the challenges of COVID-19; development of the *Healthy and Active for Life Online* program; and pivoting HPNSW branches to support local PHU responses to infectious disease threats during the pandemic.

Key learnings and achievements

Population health staff were a critical surge workforce for the NSW public health response

Across the pandemic, population health staff were a critical part of the surge workforce, comprising most staff both centrally and locally at various points of the pandemic, though particularly in the initial phases. This 'loss' of staff from BAU operations variably impacted capacity to sustain and reinstate population health programs. Many who were not involved in the response shouldered the burden of moving BAU programs forward with diminished co-workers. Respondents also identified challenges for those in BAU operations who were progressing adaptive innovation in practice, given competing demands on decision leaders. Other challenges for BAU work are discussed in Chapter 5.2 (*Workforce capability and surge capacity*).

The population health workforce faced significant changes to their roles and practice throughout the pandemic, which impacted staff morale and wellbeing over time

The population health workforce proved agile and provided useful skills and capabilities to the public health response. However, respondents reported that shifting between the response and BAU activities could be challenging. Response roles could be demanding, and fewer staff left to complete BAU activities increased workloads. In addition, staff were faced with rapid practice changes such as working from home, implementing virtual service delivery and COVID-19 safety requirements. Over time, these challenges led to a tired workforce, with some reports of burnout, staff attrition and reduced morale. Prioritising staff health and wellbeing will be important for future public health responses and recommendations related to this are included in Chapter 5.2 (*Workforce capability and surge capacity*).

High levels of flexibility and collaboration among program partners ensured ongoing service delivery was possible

Extensive collaboration between service partners was required to manage demands on services, including restrictions during lockdowns, staff shortages, supply of PPE, shifts to virtual platforms and impacts on increasing waiting lists. High levels of cooperation between sectors and the breaking down of traditional barriers were noted. Respondents reported that early engagement with relevant stakeholders to provide information and navigate system issues was essential. In addition, communities of practice – either existing or newly established during the pandemic – were reported to be useful for communication, knowledge sharing and problem-solving purposes. Rapid policy change facilitated at a state level also helped to support adherence to public health measures (e.g. increasing the number of take-home doses allowable under the OTP). This collaboration also brought cross-team learning opportunities. Respondents noted that it would be useful to maintain some of this agility and collaboration post-COVID-19, with similar mechanisms to facilitate collaboration put in place during future public health events.

Technology platforms and hybrid forms of service delivery were widely adopted but ongoing work is required to understand the relative advantages and disadvantages of these adaptations and their potential interoperability and scalability

Online platforms were used by the population health workforce during the pandemic to improve communication and engagement between colleagues and service partners, and for training and knowledge sharing purposes. Respondents noted that these mediums were now widely accepted and offered efficiencies, especially where program partners were located across large geographical areas. They also allowed the timely sharing of information when significant, rapid, and ongoing change was occurring. However, disadvantages were noted, including staff feeling less connected to their workplace and experiencing isolation with fewer in-person interactions.

CASE STUDY 24
Teledentistry in Western NSW Local Health District

Dental care generates aerosols and there were concerns about its potential for the transmission of COVID-19. As such, NSW Health dental clinics across the state ceased all routine dental care when stay-at-home restrictions were in place. Services were restricted to urgent and emergency care only. Outreach services to smaller, more remote towns also ceased. To help manage this and to help triage the more urgent dental conditions, Western NSW Local Health District (WNSWLHD) implemented a teledentistry service.

The teledentistry service involved dentists conducting telehealth assessments with patients over the phone to determine which patients could postpone their care without the need for immediate clinical treatment, and who should be prioritised. Systems were also set up to send e-prescriptions or fax print prescriptions to local pharmacies, so clients could be prescribed medication for pain relief.

A phone survey of 128 patients who had received a telephone assessment in the past 12 months found that 80% of clients thought it was better to have a phone assessment rather than a 10 minute in-person assessment appointment.

Teledentistry was reported to have the following benefits:

- clients from across the LHD were able to access the service more easily; they did not have to travel long distances for an in-person assessment that could be just 10 minutes in length
- clients were more comfortable with the assessment as it was not in the clinical environment, making them more receptive to oral health education
- clients were able to provide an accurate report on their current medications
- staff travel between clinics was reduced, freeing up time to support other work.

Limitations and challenges were identified. Effective treatment planning is more difficult over the phone as there is an absence of visual examination and the ability to conduct the usual clinical tests. Engaging intepreters can also be difficult. There were also concerns that delaying physical treatment during COVID-19 stay-at-home restriction periods would result in future spikes in dental emergencies. This is because most dentistry is procedural.

Due to the positive outcomes for patients and staff, phone assessments for some adult patients have continued in WNSWLHD. For patients who have limited mobility or where there are geographic challenges, telehealth models may have application in assessing treatment needs into the future.

Respondents reported that many clients valued having access to telehealth appointments and hybrid modes of service delivery. Some adaptations have already undergone evaluation. For example, in the Western NSW LHD teledentistry service (see Case Study 24), a survey of 200 patients found that 85% of clients preferred a phone appointment (where a phone appointment was sufficient in addressing their dental concerns) over an in-person appointment. Staff also noted efficiencies related to telehealth appointments. In addition, the uptake of online healthy lifestyle programs was higher than expected. Potential disadvantages included missing signs that could easily be picked up in an in-person appointment, such as family and domestic violence, mental health issues, or indications of disability. Further, social interaction can be an important aspect of an intervention and its absence may lead to reduced treatment compliance and greater social isolation. It is also important to acknowledge that virtual care may not be suitable for those not confident with technology or with poor phone/internet access.

The importance of considering flexibility in program design, to support continuity of delivery when traditional methods are not available, is an important consideration for future service delivery. New methods of service delivery also offer opportunities for increased access, particularly in rural and remote areas, or where participants are time poor or do not have access to transport services.

CASE STUDY 25
Re-orienting the Opioid Treatment Program to meet the challenges of COVID-19

The NSW Opioid Treatment Program (OTP) aims to reduce the social, economic and health harms associated with opioid use by delivering pharmacotherapy and associated services to opioid-dependent patients in NSW. Prior to COVID-19, OTP clients travelled to clinics and pharmacies to receive their daily medication. This method of service delivery was identified as likely to increase the transmission of COVID-19 during the pandemic as in-person treatment would expose clients to other individuals who may be COVID-19 positive. As a result of their history of opioid dependence, people on the OTP are also at increased risk of coexisting health conditions that make them more vulnerable to complications from COVID-19. In addition, with opioid withdrawal symptoms similar to COVID-19 symptoms, OTP clients may not be aware if they have COVID-19 and need to isolate, inadvertently exposing other clients to infection when collecting their medication each day.

Therefore, the Centre for Alcohol and Other Drugs, NSW Ministry of Health, put in place several strategies to ensure the almost 23,000 OTP patients in NSW could safely continue their treatment during COVID-19. These strategies aimed to reduce the number of times clients attended the clinic or pharmacy to collect their medication or the extent of social contact they encountered during treatment, and included:

- conducting case management appointments by phone where appropriate
- increasing the number of takeaway doses prescribed to reduce the number of in-person collections (this included the provision of take home naloxone to treat inadvertent overdoses)
- permitting medication (and naloxone) to be collected by a nominated friend or family member if the individual was in isolation
- rapidly rolling out depot buprenorphine, an OTP medication that is administered weekly or monthly, to help reduce the number of medical appointments required by clients
- moving treatment access points from a clinic to community pharmacy sites to reduce congregation around a single collection point.

A particular challenge was managing attendance at clinic locations, which OTP clients regularly attended prior to COVID-19. The number of clients visiting clinics was reduced, both to promote physical distancing and to manage staffing capacity. In general, fewer staff were available due to isolation/quarantine requirements or redeployment to support the COVID-19 response. More pharmacies were therefore engaged to take on the role of clinics. There were several advantages to this approach, including:

- pharmacies had longer opening hours and therefore were able to include more patient appointments over a longer period, ensuring physical distancing could be maintained
- more pharmacies existed than clinics, providing more options if closures were necessary and reducing the distance travelled by some clients to access medication
- pharmacies could efficiently make up takeaway doses so waiting times to receive medication were reduced.

The prescription of depot buprenorphine was a significant success story of the pandemic. Prior to the emergence of COVID-19 there was an 18-month plan in place to deliver in-person training to clinicians across the state to administer this new medication. The pandemic made online training courses more acceptable to service providers. As a result, the number of clients on the formulation increased from approximately 80 at the end of 2019, to over 1,700 in 2020, and over 4,500 in 2021.

OTP ‘take-aways’ were generally very well taken up. A survey completed by one local health district indicated clients managed the cost of dosing at pharmacies and there were low instances of negative outcomes.

CASE STUDY 26

Development of the *Healthy and Active for Life Online* program for older adults

Prior to the COVID-19 pandemic the Centre for Population Health (CPH) was piloting a healthy lifestyle program for older adults called *Healthy and Active for Life*. It was a free 10-week group-based program for adults aged 60 years and over who met in-person, weekly. The program covered topics including healthy eating and physical activity and participants were supported to complete strength and balance exercises. CPH was responsible for developing and managing the program at the state level. This included providing program resources to local health districts (LHDs) and training local service providers. LHDs were funded to deliver the program and coordinate local program implementation.

In March 2020, delivery of the program ceased due to COVID-19. To enable continued service provision, CPH re-developed the program to an online format. This involved adapting content from the original face-to-face program into online modules and engaging a website developer to create an online platform for user access. CPH also developed program delivery manuals and online training videos for LHD program coordinators and service providers. The online platform allowed participants to be allocated to their respective LHD for local management and for participant outcomes to be recorded. Local program coordinators were responsible for mailing program resources to participants and engaged qualified professionals to provide telephone support to participants. Program coordinators were also responsible for local promotion of the program.

The online program ran for 10 weeks, starting at the beginning of each school term. Participants engaged with the program as individuals rather than in a group and were able to register online. The program included access to weekly online healthy lifestyle modules, online exercise demonstrations and weekly telephone coaching calls to keep participants motivated.

While the LHD program teams were initially unsure about whether the online program would be attractive to the target population, engagement and uptake from participants was higher than expected. One challenge was internet access in rural and remote areas, which limited program uptake and full program participation in some locations.

As CPH developed the online program, it had full ownership of the program's intellectual property. This enabled better control of the program in a time of swift and large-scale change and allowed CPH to respond to challenges and participant needs in an agile way.

Healthy and Active for Life Online continues to be available across the state. It offers a useful alternative to community-based group exercise programs for older adults. A randomised controlled trial is currently underway to investigate the program's effectiveness.

Developing risk matrices and prioritisation protocols for population health service delivery was important and these should be regularly reviewed and updated throughout pandemics

Statewide risk matrices and policy directives stipulating how clients should be prioritised for treatment were important tools for local practice during the COVID-19 pandemic. Respondents also reported that it was important to have consistent approaches to decide which projects would be put on hold and how projects could be scaled up or down, depending on staffing capacity. Understanding essential minimum service delivery components and the core business requirements of service providers was part of this process. This information should be kept up-to-date to help with the rapid prioritisation of services at the onset of future events. However, respondents noted that even with comprehensive business continuity plans in place it was hard to fully prepare for an event as significant and sustained as the COVID-19 pandemic.

COVID-19 had variable impacts on service provision and efforts are underway to address lags related to the impact of COVID-19

Respondents reported variable impacts of service modifications, disruptions on service utilisation, and availability for screening and treatment services. For example, public dental service waiting lists,

and the proportion of clients waiting longer than recommended to access treatment, increased from 27% in January 2020 to 43% in February 2022. However, in a major achievement this proportion has reduced to 18%, with waiting lists as of November 2022 now lower than pre-pandemic levels. A small drop in equipment distribution was observed for the NSP (1% decrease in 2020 and 7% decrease in 2021 compared to 2019). Distribution activities were maintained in most outlets with some adaptations (e.g. postal delivery), however, respondents reported that other aspects of care were impacted, such as opportunities to receive bloodborne virus testing and education at NSP outlets. For alcohol and other drug services, a 14% decrease was reported between 2018/19 and 2020/21 in public non-admitted services accessed by clients, although some services were transferred to the private sector. Respondents suggested that clients may have been less inclined to fully engage with services due to screening processes and other COVID-19 safety measures.

The impacts on health promotion programs were less clear at the time this report was written. Most health promotion teams had returned from COVID-19 deployment as of May 2022, but some key LHD staff were still deployed or had left their pre-COVID roles. Respondents reported that LHD health promotion teams were still working at reduced capacity compared to pre-COVID staffing levels. Staffing changes within other LHD teams and partner agencies, necessary for implementation success, were reported to be affecting program continuity and return to BAU activities.

The COVID-19 response has brought fresh evaluation of some BAU operations

Respondents identified that post hoc reflections on the COVID-19 response have brought a fresh evaluation of some BAU operations. COVID-19 has, in effect, been a BAU 'circuit breaker' in that the lessons learned in the response are now informing how programs are reinstated, sometimes with changed priorities and altered practices.

A systematic process to capture local service adaptations and innovations would be useful to inform future program and service design

Each LHD operates differently based on the unique needs of the communities it services. This extended to how each LHD responded, and continues to respond, to the COVID-19 pandemic. While communities of practice and advisory forums allowed service delivery innovations to be shared within program areas during the pandemic, respondents reported that it would be useful if there were systematic mechanisms to share innovations more widely, across policy and program areas within the Ministry, and to LHDs, NGOs and private service providers.

CASE STUDY 27

Pivoting Health Protection NSW branches to support local public health unit responses tosignificant infectious disease threats during the COVID-19 pandemic

Health Protection NSW consists of the Communicable Diseases (CD), Enterics Zoonoses and Multi-resistant Organisms (EZMRO), and Environmental Health branches. These branches are designated with strategic control of infectious disease and environmental health threats in NSW. As COVID-19 cases emerged in NSW, most staff were immediately redeployed to the response given some skillsets for the response directly aligned with those of staff within these branches (particularly those of the CD and EZMRO teams). A small team representing less than one-sixth of usual full-time employees across these branches remained in 'business as usual' (BAU) to support the essential control of all other infectious disease threats and routine immunisation activities.

The CD BAU Branch immediately established the *Communicable Diseases Guidelines for Public Health Workload Prioritisation during Covid-19*. This became the 'what to drop' authority for public health units (PHUs). This guideline aimed to ensure PHUs had clear guidance on what priority conditions, besides COVID-19, required public health controls to keep people safe from the most serious and transmissible infections; outlined key contact details of staff remaining on BAU; and articulated where the CD BAU Branch had skills and access to relevant clinical systems enabling support to PHUs. This protocol was revised twice with new waves of COVID-19 ameliorating the pressures on PHUs.

The CD BAU Branch assumed a range of routine operational functions normally provided by PHUs to protect the population of NSW from disease threats. This included:

- assistance with follow-up of infectious syphilis in women of reproductive age, pregnant women with syphilis and possible congenital syphilis cases, and bloodborne viruses/sexually transmissible infections in children aged under 16 years
- hepatitis health undertakings
- foodborne outbreak investigations
- interviews to support investigation of other potential disease clusters (e.g. *Legionella pneumophila*)
- laboratory follow-up, including working with reference laboratories to provide additional testing on specimens where case interviews could not be routinely conducted (e.g. whole genome sequencing of Shiga toxin-producing *E. coli* infections to rule out potential for missed clusters)
- mass contact tracing (including text messaging).

This was either operationalised as routine under the guideline (in the case of foodborne outbreaks) or was available on request once PHUs identified competing priorities and the need to prioritise the most critical issues. More complete assistance to PHUs was not possible since the CD BAU Branch did not have full access to the suite of clinical systems available to local PHUs, particularly eMR.

Despite significant human resource challenges, the CD BAU Branch developed innovative ways of working, such as:

- rebuilding standard operating processes so that all functions could be completed remotely
- integrating new technologies to create efficiencies in processes (SMS technology through Whispir)
- daily reprioritising of tasks across available resources.

The rapid re-pivoting of the CD BAU Branch to identify the most essential public health interventions and to provide support for PHUs was critical to maximising local surge capabilities during the pandemic. Staff demonstrated strong leadership under difficult conditions, flexibility, and exceptional commitment to public health principles at a time of dispersed resources.

Recommendations

Now	
6.1	Implement a process for sharing adaptations to population program/service delivery made during COVID-19 across the Ministry, LHDs and NGOs to inform future program and service design.
6.2	Population health policy areas should assess which adaptations to service delivery made in response to COVID-19 were effective and should form part of standard program and service delivery.
Future pandemics	
6.3	Develop risk assessment and mitigation approaches to minimise impacts on population health programs and services during a large scale pandemic response.

References

Australian Institute of Health and Welfare (AIHW) 2022, *Australia's health 2022: data insights*, cat. no. AUS 240, Australia's health series number 18, AIHW, Australian Government, Canberra.

Crane M, Nathan N, McKay H et al 2022, 'Understanding the sustainment of population health programmes from a whole-of-system approach', *Health Res Policy Syst*, vol. 20, no. 37, DOI: 10.1186/s12961-022-00843-0.

Sutherland K, Chessman J, Zhao J et al 2020, 'Impact of COVID-19 on healthcare activity in NSW, Australia', *Public Health Res Pract*, vol. 30, no. 4, DOI: 10.17061/phrp3042030.

7 Cross-cutting themes

This chapter describes cross-cutting themes that emerged from the debrief process. Cross-cutting themes are issues that were relevant to several functional areas of the response, that were perceived to have a broad influence on response effectiveness, and that have implications for future pandemic responses. They cover a broad range of areas and themes as outlined below.

The response was characterised by collegiality, cooperation and a common sense of purpose

The response was characterised by collegiality among the public health network and health system, as well as across government. Many respondents described experiencing a common sense of purpose that spurred people to go above and beyond, despite the challenges.

Enabling traditional silos to be broken down brought efficiency gains in business practices

Traditional silos were broken down and bureaucratic 'red tape' was removed through necessity. Usual governance processes were streamlined, enabling decision making and action at a much faster pace. In addition, new business practices were rapidly adopted, such as hybrid working and use of collaboration tools such as Microsoft Teams, Zoom and SharePoint. It was felt important to maintain changes and efficiencies in business practice gained during the pandemic, while balancing the need for stronger governance as we return to BAU.

Strong relationships forged across the pandemic between NSW Health, other government agencies, NGOs and community groups warrant sustained engagement

The pandemic resulted in stronger relationships between the public health response and different sectors, including cross-government agencies like DCS, Multicultural NSW, Aboriginal Affairs NSW, Department of Premier and Cabinet, and Treasury. In addition, there was greater cross-health system collaboration. Though these relationships were tested at times, given time-critical demands, they have ultimately been strengthened. These relationships should be maintained and used to improve broader implementation of population health policy and program delivery into the future.

The ability to scale innovations across multiple functional areas was a major achievement of the public health response

The rapid scale-up of innovations across testing, contact tracing, epidemiology and surveillance, information and technology systems, and virtual care were all major achievements in NSW. Similarly, the rapid translation of research into practice was a significant achievement by international standards (see Case Studies 21 and 22). This rapid scale-up appears to have had some important enablers, including long-term investment in 'research ready' environments and investment in the population health workforce through training programs in public health, Aboriginal population health, and biostatistics. Other enablers include effective collaboration across NSW Health and the ability to rapidly leverage long-term partnerships with academia, non-government and private sector organisations.

Flexibility in the response was critical to effective public health action

The COVID-19 pandemic required high levels of agility in strategy, process and response structure. The response was constantly adapted to the changing context, case numbers and variant characteristics. Staff across the public health network and NSW Health more broadly displayed great flexibility and willingness to contribute to the response in whatever capacity was needed. Respondents reported often being required to work in areas outside their normal areas of expertise. Through this, many reported they developed new skills, expertise and capabilities. A culture of 'mucking in' and 'getting the job done' was reported throughout the pandemic but it is important to recognise that the flexibility required was very challenging for some staff and that even those who displayed a willingness to be flexible reported being challenged by the agility required in a prolonged pandemic response.

The collaborative approach to surge across LHDs was a key success of the response

A positive outcome of the pandemic was greater collaboration across the NSW public health network. LHDs and PHEOC/PHRB worked together at various stages to shift resources from one LHD to another as the need arose. Respondents reported that the learnings and experiences gained working in one LHD were then applied in home LHDs when their cases

surged. Support was also provided across the public health and health system responses, with a proportion of staff shifting across both parts of the broader pandemic response.

Rural and remote areas experienced distinct challenges centred around workforce capacity and service access and require particular attention in future pandemic plans

There are distinct challenges in implementing public health responses in rural and remote communities, centred around workforce availability and logistical issues associated with remoteness and lower population density. Respondents identified that rural staff demonstrated high levels of flexibility out of necessity and often assumed multiple roles in the pandemic response due to limited workforce availability. Another issue identified by respondents was that access to suitable accommodation was a barrier to effective isolation in some remote communities.

Effective planning and horizon scanning was important throughout the response

There was a need to balance the 'now' focused activity with strategic planning and horizon scanning. It was recognised that enhancing and developing these capabilities is an area that should be given greater prominence in response structures both centrally and locally.

COVID-19 shone a light on pre-existing inequity

The influence of social and economic factors on health status and equity have been well known for decades. Social determinants are the conditions in which people are born, grow, work, live and age, and the wider set of forces and systems shaping the conditions of daily life (WHO 2022b). COVID-19 shone a light on these pre-existing inequities. To illustrate, in both Australia and internationally people in precarious, low paid, manual jobs in the caring, retail and service sectors have been more exposed to COVID-19 as their face-to-face jobs cannot be done from home (Patel et al. 2020). Overcrowded, poor quality housing in densely populated areas has often added to their increased risk. Poorer communities have also been more vulnerable to severe disease once infected because of higher levels of pre-existing illness (Patel et al. 2020). Consequently, it was more challenging for some segments of the NSW population to comply with public health orders due to the nature of their financial situation, work status and family structures (Multicultural NSW 2022). Chapters 4.1 and 4.2 detail the challenges and learnings associated with communicating and engaging with Aboriginal people and CALD communities during the pandemic, and the innovative approaches used to reach these populations with public health messaging and action.

Communicating to the community for behaviour change and use of behavioural science methods is important to effective public health response

Combining behavioural science with communications strategy and community engagement was thought essential to effective pandemic response. Behavioural science is the systematic study of human behaviour and uses observation, interviews, surveys and experiments to explain when and why individuals behave as they do (WHO 2022a). Effective communication requires more than provision of information. It requires using formative research, community consultation and broader research evidence to inform the development of multiple strategies to communicate risk and to persuade target groups to take specific actions. The benefits of behavioural science were also recognised in CALD and Aboriginal community engagement during the response.

Some marginalised populations were particularly challenging to reach and this needs to be addressed in pandemic plans with the learning incorporated into BAU activities

Despite the challenges, it is important to recognise that the public health and health system responses did engage with a wide range of marginalised populations in relation to health information, risk communication, requirements under public health orders, and vaccination. Marginalised populations are groups and communities that experience discrimination and exclusion because of unequal power relationships across economic, political, social and cultural dimensions (NCCDH 2022). This was a challenge shared across Australia and internationally (WHO et al. 2020). Some of the most difficult to reach marginalised groups in NSW during the response were homeless people, those with alcohol and other drug dependencies, and those engaged with the criminal justice system.

Each of these groups present unique challenges for engagement with government services and health systems which were amplified during the pandemic.

However, there were outstanding examples of how locally targeted public health action was adapted to meet the needs of marginalised populations. For example, in September 2021 a significant COVID-19 outbreak occurred in complex vulnerable populations experiencing homelessness in Eastern Sydney. The outbreak was sustained for three months, occurred across multiple settings, and was often linked by way of social connection or exposure in waiting areas of an essential service provider (i.e. public guardian, food donation distributor or medical services provider). A case study of the multi-agency response to 'stop and stay' orders in Eastern Sydney was an excellent example of how public health action could be adapted and partnerships formed with other government agencies and NGOs to protect homeless people (see Case Study 28 in Appendix E).

The transition from reactive to planned work programming is a challenge in a continuum of change

A key theme consistently raised by Ministry and LHD respondents was the challenge of shifting from a reactive public health response to planned and more strategic work practices. Response teams were required to make decisions hour-to-hour and day-to-day, making it difficult to think beyond immediate issues. Getting the right balance between the immediate focus required by the pandemic and the need for longer-term strategic perspective will need to be a focus of HPNSW and the public health network moving forward as the ongoing COVID-19 response is integrated into BAU.

Effectively managing staff welfare is vital in pandemic responses

An issue almost universally raised by respondents in the debrief was the impact of a prolonged pandemic response on staff welfare and the importance of managing this proactively in future pandemics. Chapter 5.2 (*Workforce capability and surge capacity*) provides recommendations for addressing this issue.

Staff reflected on ethical issues inherent in public health practice as part of the pandemic response

Respondents acknowledged that public health responses can involve measures that may challenge staff values. Some identified ethical issues inherent in public health practice, such as balancing individual freedom and autonomy versus necessary restrictions, arising in settings like aged care and in the broader enforcement of isolation requirements. Providing response staff opportunities to discuss and reflect on these challenges was identified by respondents as an important staff welfare measure and professional practice enhancement.

Capturing key learnings and maintaining corporate history is a major challenge in the transition towards an endemic state of COVID-19

Throughout the pandemic, public health response operations and workforce surged and contracted both centrally and locally. Significant lessons have been learned as a result. There should be systematic ways of collecting these learnings before workforce contraction. Considering this, there is great value in systematically reflecting on experiences and lessons learned throughout the pandemic using more intra-action and after-action reviews in future emergency responses to complement existing debrief processes.

The pandemic response surfaced a range of important training needs for those participating in this and future responses

While available time for training was often limited, certainly at peaks in activity, one theme was that more or different training opportunities would have strengthened system capabilities. These included areas as diverse as management training; working within an ICS; Aboriginal health and culturally appropriate policy development; and tailoring messages when working with local context and CALD communities.

References

Multicultural NSW 2022, *The state of community relations in NSW: Community Relations Report 2020-21*, NSW Government, Sydney, <https://multicultural.nsw.gov.au/other-publications/the-state-of-community-relations-in-nsw-community-relations-report-2020-21>.

National Collaborating Centre for Determinants of Health (NCCDH) 2022, *Glossary of Essential Health Equity Terms Marginalized populations*, NCCDH, accessed 9 August 2022, <https://nccdh.ca/glossary/entry/marginalized-populations>.

Patel JA, Nielsen FBH, Badiani AA et al 2020, 'Poverty, inequality and COVID-19: the forgotten vulnerable', *Public Health*, vol. 183, pp. 110-11, DOI: 10.1016/j.puhe.2020.05.006.

WHO, IFRC, OCHA 2020, *COVID-19: How to include marginalized and vulnerable people in risk communication and community engagement*, accessed 9 August 2022, <https://cities4health.org/assets/library-assets/covid-19-rcce-guidance-update-200422.pdf>.

World Health Organization (WHO) 2022a, *Behavioural sciences for better health initiative*, WHO, accessed 9 August 2022, <www.who.int/initiatives/behavioural-sciences>.

World Health Organization (WHO) 2022b, *Social determinants of health website*, WHO, accessed 9 August 2022, <www.who.int/health-topics/social-determinants-of-health#tab=tab_1WH>.

8 Appendices

Appendix A

List of acronyms

AAR after-action review

ACCHS Aboriginal Community Controlled Health Services

ADF Australian Defence Force

AEFI adverse events following immunisation

AH&MRC Aboriginal Health and Medical Research Council

AIR Australian Immunisation Register

APPRISE Australian Partnership for Preparedness Research on Infectious Disease Emergencies

BAU business as usual

CAH Centre for Aboriginal Health

CALD culturally and linguistically diverse

CCAS COVID-19 Case Assessment System

CCON COVID-19 Contact Notification

CCTT Central Contact Tracing Team

CDNA Communicable Diseases Network Australia

CE Chief Executive

CEE Centre for Epidemiology and Evidence

CIU Critical Intelligence Unit

CoP community of practice

CPH Centre for Population Health

CSNSW Corrective Services NSW

DCS Department of Customer Service

ECEC early childhood education and care

EMPLAN Emergency Management Plan

ERPR Emergency Response Priority Research

FTE full-time equivalent

GP general practitioner

HPLT Health Protection Leadership Team

HPNSW Health Protection NSW

IAP Incident Action Plan

ICS Incident Control System

ICU intensive care unit

IT information technology

JHFMHN Justice Health and Forensic Mental Health Network

LGA local government area

LHD local health district

MHCS Multicultural Health Communication Service

NCIMS Notifiable Conditions Information Management System

NCIRS National Centre for Immunisation Research and Surveillance

NDIS National Disability Insurance Scheme

NGO non-government organisation

NSW New South Wales

ODS Operational Data Store

OTP Opioid Treatment Program

PCR polymerase chain reaction

PHEOC Public Health Emergency Operations Centre

PHRB Public Health Response Branch

PHREDSS Public Health Rapid, Emergency, Disease and Syndromic Surveillance

PHU public health unit

PHLN Public Health Laboratory Network

PPE personal protective equipment

PRSP Prevention Research Support Program

RACF residential aged care facility

RACGP The Royal Australian College of General Practitioners

RAT rapid antigen test

RDCF residential disability care facility

SARS severe acute respiratory syndrome

SBS Special Broadcasting Service

SHEOC State Health Emergency Operations Centre

SSP schools for specific purposes

TAFE Technical and Further Education

TGA Therapeutic Goods Administration

TTIQ Test-Trace-Isolate-Quarantine

VMT Venue Management Team

WHO World Health Organization

Appendix B

List of stakeholders

More than 250 personnel were engaged through the NSW COVID-19 Public Health Response Debrief process across stakeholder consultations and contributions of all kinds. The table below outlines the stakeholders who contributed to the debrief and their contribution input. Note, the organisation assigned to each stakeholder reflects their role during the COVID-19 public health response rather than their current business as usual position.

Name	Organisation	Contribution to the debrief
Adelaide Nyinawingeri	Public Health Unit, Northern Sydney Local Health District	Case study
Dr Adrian Dunlop	Hunter New England Local Health District	Case study
Dr Alexander Drew	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Alexander Willems	Centre for Epidemiology and Evidence, NSW Ministry of Health	Case study
Alice Connors	Centre for Alcohol and Other Drugs, NSW Ministry of Health	Survey
Dr Alicia Arnott	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Amanda Stephinson	Strategic Communications and Engagement, NSW Ministry of Health	Survey
Andrew Davison	Health System Strategy and Planning, NSW Ministry of Health	Interview
Dr Andrew Ginn	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Dr Andrew Milat	Centre for Epidemiology and Evidence, NSW Ministry of Health	Case study
Prof. Andrew Wilson	University of Sydney	Sense check consultation
Anne Field	Western NSW Local Health District	Case study
Dr Antonio Penna	Office for Health and Medical Research, NSW Ministry of Health	Sense check consultation
Dr Archana Koirala	National Centre for Immunisation Research and Surveillance	Case study
Ashleigh Armanasco	Centre for Epidemiology and Evidence, NSW Ministry of Health	Case study

Name	Organisation	Contribution to the debrief
Aurysia Hii	Centre for Epidemiology and Evidence, NSW Ministry of Health	Case study
Belinda Duckworth	Centre for Population Health, Western Sydney Local Health District	Case study
Assoc Prof. Bette Liu	National Centre for Immunisation Research and Surveillance	Case study
Bianca Prain	Centre for Population Health, NSW Ministry of Health	Survey
Brian Shimadry	Workforce Planning and Talent Development, NSW Ministry of Health	Sense check consultation
Camilla Lobo	Justice Health and Forensic Mental Health Network	Case study
Carmen Pereira	HealthShare NSW, NSW Health	Interview
Dr Carl Suster	Centre for Infectious Diseases and Microbiology-Public Health	Case study
Dr Caroline Sharpe	Office of the Chief Health Officer, NSW Ministry of Health	Case study, interview
Carolyn Murray	Public Health Response Branch, NSW Health	Case study, interview
Catherine Kellick	Office for Health and Medical Research, NSW Ministry of Health	Sense check consultation
Charlee Law	Hunter New England Local Health District	Case study
Christine Innes-Hughes	Public Health Response Branch, NSW Health	Interview
Dr Christine Selvey	Public Health Response Branch/COVID Influenza Branch, NSW Health	Interview, sense check consultation, survey
Claire Harper	Public Health Response Branch, NSW Health	Workshop
Dr Claire Larter	Therapeutic Goods Administration	Case study
Colette Mcgrath	Justice Health and Forensic Mental Health Network	Case study
Conor Cullen	Strategic Communications and Engagement, NSW Ministry of Health	Sense check consultation
Curtis Gregory	Public Health Unit, Illawarra Shoalhaven Local Health District	Interview, sense check consultation
Danielle Campbell	Centre for Epidemiology and Evidence, NSW Ministry of Health	Case study
Danijela Radovanovic	Public Health Response Branch, NSW Health	Interview
Darrin Eade	State Emergency Preparedness and Response Branch, NSW Health	Sense check consultation
Dr David Durrheim	Health Protection, Hunter New England Local Health District	Case study
Dawn Arneman	Centre for Epidemiology and Evidence, NSW Ministry of Health	Case study
Dee Upton	Centre for Population Health, NSW Ministry of Health	Case study
Prof. Dominic Dwyer	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study

Name	Organisation	Contribution to the debrief
Dr Elena Martinez	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Elissa Miller	Centre for Population Health, Western Sydney Local Health District	Case study
Ellen Donnan	Health Protection NSW, NSW Health	Case study, interview
Elspeth Kay	Therapeutic Goods Administration	Case study
Dr Emma Goeman	National Centre for Immunisation Research and Surveillance	Case study
Geraldine Wilson	Centre for Aboriginal Health, NSW Ministry of Health	Sense check consultation, survey
Dr Gideon Meyerowitz-Katz	Public Health Unit, Western Sydney Local Health District	Case study
Gillian Giles	Public Health Response Branch, NSW Health	Workshop
Dr Grace Blackwell	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Dr Heather Cameron	Western NSW Local Health District	Case study
Assoc Prof. Heather Gidding	National Centre for Immunisation Research and Surveillance	Case study
Helen Gardiner	Centre for Aboriginal Health, NSW Ministry of Health	Sense check consultation
Helen Noonan	Public Health Unit, Western Sydney Local Health District	Case study
Dr Isabel Brouwer	NSW Health Pathology	Case study
Dr Isis Maitland-Scott	Health Protection NSW, NSW Health	Case study
Jacqui Worsley	COVID-19 Program Management Office, NSW Ministry of Health	Interview
James Broughton	Health and Social Policy Branch, NSW Ministry of Health	Interview
Dr Jan Fizzell	Office of the Chief Health Officer, NSW Ministry of Health	Interview
Janet Tyler	Public Health Response Branch, NSW Health	Workshop
Dr Jen Kok	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Dr Jenny Draper	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Dr Jeremy McAnulty	Public Health Response Branch/Health Protection NSW, NSW Health	Case study, interview, sense check consultation, survey
Dr Jessica Agius	Centre for Infectious Diseases and Microbiology-Public Health	Case study

Name	Organisation	Contribution to the debrief
Jo Blackwell	Workforce Planning and Talent Development, NSW Ministry of Health	Sense check consultation
Joanna Forbes	Public Health Response Branch, NSW Health	Interview
Dr Joanna Sutherland	Health Protection NSW, NSW Health	Case study
Joanne Edwards	State Health Emergency Operations Centre	Interview
Jody Houston	Public Health Unit, South Eastern Sydney Local Health District	Case study
John Ward	Centre for Population Health, NSW Ministry of Health	Case study
Joseph La Posta	Multicultural NSW	Sense check consultation
Julia King	Office of the Chief Health Officer, NSW Ministry of Health	Case study
Julie Letts	Public Health Response Branch, NSW Health	Case study
Kara Clarke	Centre for Oral Health Strategy, NSW Ministry of Health	Survey
Kate Broome	Health Protection NSW, NSW Health	Workshop
Kate McGregor	Office for Health and Medical Research, NSW Ministry of Health	Sense check consultation
Kate Ward	Public Health Response Branch, NSW Health	Interview
Dr Kath Keenan	Aboriginal Health and Medical Research Council	Interview
Dr Katherine Todd	Public Health Unit, Northern Sydney Local Health District	Case study
Katie Brett	Hunter New England Local Health District	Case study
Keira Glasgow	Health Protection NSW, NSW Health	Case study, interview
Dr Kerri Basel	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Dr Kerry Chant	Population and Public Health, NSW Health	Case study, interviews
Prof. Kristine Macartney	National Centre for Immunisation Research and Surveillance	Case study
Kristy Crooks	Hunter New England Local Health District	Case study
Kylie Taylor	Hunter New England Local Health District	Case study
Lauren Chuter	Centre for Population Health, NSW Ministry of Health	Case study
Lauren Owen	Aboriginal Health and Medical Research Council	Interview
Dr Lee Taylor	Centre for Epidemiology and Evidence, NSW Ministry of Health	Interview, survey
Lina Persson	Centre for Epidemiology and Evidence, NSW Ministry of Health	Workshop
Lou Orszulak	Centre for Infectious Diseases and Microbiology-Public Health	Case study
Dr Mailie Gall	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study

Name	Organisation	Contribution to the debrief
Mandy Williams	Public Health Unit, South Western Sydney Local Health District	Interview
Mareeka Hair	Health Protection NSW, NSW Health	Case study
Dr Marianne Gale	Public Health Response Executive, NSW Ministry of Health/Population and Community Health, South Eastern Sydney Local Health District	Interview, sense check consultation
Marianne Haleblian	Health and Social Policy Branch, NSW Ministry of Health	Interview
Marnie O'Brian	NSW Department of Education	Case study
Matthew Pearson	Workforce Planning and Talent Development, NSW Ministry of Health	Sense check consultation
Dr Meg Whitley	Public Health Unit, Central Coast Local Health District	Interview
Megan Cobcroft	Centre for Population Health, NSW Ministry of Health	Case study
Melissa Irwin	Public Health Response Branch, NSW Health	Workshop
Dr Michael Douglas	Public Health Response Executive, NSW Ministry of Health	Survey
Dr Michael Staff	Public Health Unit, Northern Sydney Local Health District	Case study
Dr Michelle Cretikos	Public Health Response Executive, NSW Ministry of Health	Interview, survey
Ministry of Health Communications Team	Strategic Communications and Engagement, NSW Ministry of Health	Case study
Dr Mitchell Smith	Public Health Unit, South Western Sydney Local Health District	Interview
Dr Naru Pal	Public Health Unit, South Western Sydney Local Health District	Interview
Assoc Prof. Nicholas Wood	National Centre for Immunisation Research and Surveillance	Case study
Patricia Morton	Office for Health and Medical Research, NSW Ministry of Health	Sense check consultation
Dr Paul Douglas	Public Health Unit, Mid North Coast and Northern NSW Local Health Districts	Interview
Paula Spokes	Public Health Response Branch, NSW Health	Case study, workshop
Population Health Executive Council	NSW Ministry of Health	Sense check consultation
Priscilla Stanley	Health Protection, Western NSW Local Health District	Case study, sense check consultation
Dr Qinning Wang	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Dr Rebecca Rockett	Centre for Infectious Diseases and Microbiology-Public Health	Case study
Dr Richard Broome	Health Protection NSW, NSW Health	Case study

Name	Organisation	Contribution to the debrief
Richard Griffiths	Workforce Planning and Talent Development, NSW Ministry of Health	Sense check consultation
Dr Roy Byun	Public Health Response Branch, NSW Health	Survey
Dr Sally Ellis	Public Health Response Branch/COVID Influenza Branch, NSW Health	Case study, interview, workshop
Sally Freeman	Public Health Unit, Central Coast Local Health District	Interview
Sarah Morton	Health and Social Policy Branch, NSW Ministry of Health	Interview
Dr Sean Tobin	Public Health Unit, Northern Sydney Local Health District	Case study
Shani Prosser	Justice Health and Forensic Mental Health Network	Survey
Assoc Prof. Sharon Chen	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Dr Shona Chandra	Centre for Infectious Diseases and Microbiology-Public Health	Case study
Dr Shopna Bag	Population Health, Western Sydney Local Health District	Case study, interview, sense check consultation
Simon Willcox	Public Health Response Branch, NSW Health	Case study
Dr Sonya Ennis	Health Protection NSW, NSW Health	Case study
Sophie Tyner	Office of the Chief Health Officer, NSW Ministry of Health	Sense check consultation
Stefanie Williams	Health and Social Policy Branch, NSW Ministry of Health	Interview
Dr Stephen Corbett	Centre for Population Health, Western Sydney Local Health District	Case study
Dr Steven Nigro	Health Protection NSW, NSW Health	Case study, interview
Sue Atkinson	Workplace Relations, NSW Ministry of Health	Interview, sense check consultation
Dr Susan Maddocks	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology	Case study
Suzanna White	Strategic Communications and Engagement, NSW Ministry of Health	Sense check consultation
Dr Tara Smith	Centre for Aboriginal Health, NSW Ministry of Health	Sense check consultation
Tim Harrold	Centre for Epidemiology and Evidence, NSW Ministry of Health	Survey
Toni Cains	Public Health Unit, South Eastern Sydney Local Health District	Case study
Tove Fitzgerald	Public Health Response Branch, NSW Health	Interview, case study
Tracey Oakman	Public Health Unit, Murrumbidgee and Southern NSW Local Health Districts	Interview

Name	Organisation	Contribution to the debrief
Tracie Reinten	Public Health Response Branch/Health Protection NSW, NSW Health	Workshop
Tracy Tsang	Public Health Unit, Western Sydney Local Health District	Case study
Travers Johnstone	Public Health Response Branch/COVID Influenza Branch, NSW Health	Interview, workshop
Trish van Tussenbroek	NSW Department of Education	Case study
Trish Wills	Public Health Response Branch, NSW Health	Case study
Vicki Manning	State Health Emergency Operations Centre	Interview
Dr Victor Carey	Public Health Response Executive, NSW Ministry of Health/Public Health Unit, Nepean Blue Mountains Local Health District	Interview
Prof. Vitali Sintchenko	Centre for Infectious Diseases and Microbiology-Public Health	Case study
Wendy Hoey	Justice Health and Forensic Mental Health Network	Survey
Will Comino	Public Health Response Branch, NSW Health	Workshop
Dr Winkie Fong	Centre for Infectious Diseases and Microbiology-Public Health	Case study
Dr Yuanee Wickramasinghe	Aboriginal Health and Medical Research Council	Interview

After-Action Review (AAR) statewide workshop participants

The table below provides the list of participants who attended the statewide After-Action Review workshop. Participants attended the workshop as representatives of their respective public health unit or team.

Name	Organisation
Dr Adam Capon	Public Health Unit, South Eastern Sydney Local Health District
Amanda Cox	Public Health Unit, Illawarra Shoalhaven Local Health District
Andrew Ingleton	Public Health Unit, Sydney Local Health District
April Roberts-Witteveen	Public Health Unit, Murrumbidgee and Southern NSW Local Health Districts

Name	Organisation
Dr Christine Selvey	Public Health Response Branch/COVID Influenza Branch, NSW Health
Deb Welsby	Public Health Response Branch, NSW Health
Freyja Smith	Public Health Unit, Mid North Coast and Northern NSW Local Health Districts
Jane Thomas	Public Health Unit, Nepean Blue Mountains Local Health District
Janet Tyler	Public Health Response Branch, NSW Health
Jennifer Case	Public Health Response Branch, NSW Health
Dr Jeremy McAnulty	Public Health Response Branch/Health Protection NSW, NSW Health
Dr Joanna Sutherland	Health Protection NSW, NSW Health
Dr John Hall	Public Health Response Branch, NSW Health
Julie Kohlhagen	Public Health Unit, Hunter New England Local Health District
Dr Katherine Todd	Public Health Unit, Northern Sydney Local Health District
Dr Khizar Ashraf	Public Health Unit, South Western Sydney Local Health District
Kristy Crooks	Public Health Unit, Hunter New England Local Health District
Lauren James	Public Health Unit, Far West and Western NSW Local Health Districts
Lina Persson	Centre for Epidemiology and Evidence, NSW Ministry of Health
Paul Cook	Public Health Unit, Central Coast Local Health District
Paula Spokes	Public Health Response Branch, NSW Health
Sophie Norton	Public Health Unit, Western Sydney Local Health District
Dr Tim Driscoll	Public Health Response Branch, NSW Health
Travers Johnstone	Public Health Response Branch/COVID Influenza Branch, NSW Health
Trish Wills	Public Health Response Branch, NSW Health

Local After-Action Review processes

Local public health units and COVID Influenza Branch teams conducted individual AAR processes that engaged over 100 people across the NSW public health network.

The local processes included workshops and completion of surveys, the outputs of which were synthesised to identify themes for the statewide AAR workshop.

After-Action Review Organising Committee

The AAR process was supported by an Organising Committee and members are listed in the table below.

Name	Organisation
Alexander Willems	Centre for Epidemiology and Evidence, NSW Ministry of Health
Amanda Robinson	Public Health Unit, Nepean Blue Mountains Local Health District
Dr Andrew Milat	Centre for Epidemiology and Evidence, NSW Ministry of Health
Ashleigh Armanasco	Centre for Epidemiology and Evidence, NSW Ministry of Health
Dr Caroline Sharpe	Office of the Chief Health Officer, NSW Ministry of Health
Dr Craig Dalton	Public Health Unit, Hunter New England Local Health District
Ely Taylor	Public Health Response Branch/COVID Influenza Branch, NSW Health
Julie Letts	Centre for Epidemiology and Evidence, NSW Ministry of Health
Tove Fitzgerald	Public Health Unit, Central Coast Local Health District

Appendix C

Emergency Response Priority Research projects

Appendix C outlines the research projects funded under the Emergency Response Priority Research workstream.

Project title	Project summary	Research lead
Serosurveillance for SARS-CoV-2 infection	Cross-sectional serosurvey of residual blood specimens collected April–June 2020 to estimate SARS-CoV-2 specific antibody seroprevalence among three subpopulations in Sydney	National Centre for Immunisation Research and Surveillance (NCIRS), University of NSW, Institute of Clinical Pathology and Medical Research
The Australian First Few 'X' (FFX) Project for COVID-19*	National prospective case-ascertained transmission study involving collection of enhanced data and specimens from laboratory confirmed cases and household contacts to study household transmission	NCIRS
Retrospective infected health care worker study	Case series of health facility acquired COVID-19 in NSW healthcare workers	University of NSW
NSW Health COVID-19 schools transmission investigation projects	Study to document transmission in school and childcare settings, with enhanced investigations via home/school visits of close contacts	NCIRS
Burden of influenza-like illness (ILI) disease in adults ≥65 yrs in aged care facilities	A study to estimate attack, hospitalisation and death rates of viral respiratory infection outbreaks in aged care facilities	University of Sydney, Western Sydney Local Health District
COVID-19 NSW Outcomes Study	Cross-sectional analysis of confirmed COVID-19 cases linked to routinely collected hospitalisation data to determine disease severity and hospital utilisation and underlying causes of admission	University of NSW
Surveillance of paediatric COVID-19, Kawasaki disease and PIMS-TS via PAEDS	Active prospective hospital surveillance for paediatric COVID-19 cases and potentially related conditions	Sydney Children's Hospitals Network
Wastewater-based epidemiology for COVID-19 (Phase 1)	Validation of Sydney Water analysis protocol for SARS-CoV-2 detection in sewage	Sydney Water, NSW Health
Monitoring and investigating the safety and effectiveness of the COVID-19 vaccination program	Project to strengthen vaccine safety surveillance systems to rapidly detect, investigate, assess, report and respond to adverse events following immunisation	NCIRS

Project title	Project summary	Research lead
NSW COVASIM analysis	Case and hospitalisation projections using the COVASIM individual-based COVID-19 model and scenario analyses to estimate the impact of various policy interventions	Burnet Institute
NSW COVID-19 modelling and epidemiological analysis	Statistical modelling linking COVID-19 case data with the effects of lockdown and vaccination, simulations and projections regarding actual and modified control strategies, and analysis of modified vaccination strategies	University of NSW
COVID-19 vaccine effectiveness studies	Assessment of vaccine effectiveness against the Delta and Omicron variants in the NSW population using linked routinely collected SARS-CoV-2 surveillance data	NCIRS

** Although the national FFX study was funded by the Australian Government Department of Health and the National Health and Medical Research Council through the APPRISE Centre of Research Excellence, initial funds were provided by NSW Health for rapid establishment and data collection in NSW.*

Appendix D

List of case studies and contributors

The table below lists the case studies that are included in the debrief report and their contributors. The organisation assigned to each stakeholder reflects their role during the COVID-19 public health response rather than their current business as usual position.

The debrief team acknowledges with thanks the efforts of contributors in developing these case studies.

Title	Contributors	
Case Study 1: The Northern Beaches outbreak: an explosive COVID-19 outbreak linked to two superspreading events, controlled by timely case and contact investigations, targeted community movement restrictions and a strong community commitment to testing	Adelaide Nyinawingeri	Public Health Unit, Northern Sydney Local Health District
	Dr Katherine Todd	Public Health Unit, Northern Sydney Local Health District
	Dr Michael Staff	Public Health Unit, Northern Sydney Local Health District
	Dr Sean Tobin	Public Health Unit, Northern Sydney Local Health District
Case Study 2: COVID-19 outbreak onsite management for apartments of concern and places of shared accommodation in South Eastern Sydney	Jody Houston	Public Health Unit, South Eastern Sydney Local Health District
	Toni Cains	Public Health Unit, South Eastern Sydney Local Health District
Case Study 3: Rapid stand-up of the Central Contact Tracing Team in early 2020	Alexander Willems	Centre for Epidemiology and Evidence, NSW Ministry of Health
	Carolyn Murray	Public Health Response Branch, NSW Health
	Julie Letts	Centre for Epidemiology and Evidence, NSW Ministry of Health
	Tove Fitzgerald	Public Health Response Branch, NSW Health
Case Study 4: An outbreak of COVID-19 in a large meal kit factory in Sydney, Australia	Dr Gideon Meyerowitz-Katz	Public Health Unit, Western Sydney Local Health District
	Helen Noonan	Public Health Unit, Western Sydney Local Health District
	Dr Shopna Bag	Population Health, Western Sydney Local Health District
	Dr Stephen Corbett	Centre for Population Health, Western Sydney Local Health District
	Tracy Tsang	Public Health Unit, Western Sydney Local Health District
Case Study 5: COVID-19 modelling and the Modelling Science Table	Dr Andrew Milat	Centre for Epidemiology and Evidence, NSW Ministry of Health
	Dr Robyn Newson	Centre for Epidemiology and Evidence, NSW Ministry of Health

Title	Contributors	
Case Study 6: Whole genome sequencing to track COVID-19	Dr Alexander Drew	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Alicia Arnott	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Andrew Ginn	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Carl Suster	Centre for Infectious Diseases and Microbiology-Public Health
	Prof. Dominic Dwyer	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Elena Martinez	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Grace Blackwell	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Jen Kok	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Jenny Draper	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Jessica Agius	Centre for Infectious Diseases and Microbiology-Public Health
	Dr Kerri Basel	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Lou Orszulak	Centre for Infectious Diseases and Microbiology-Public Health
	Dr Mailie Gall	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Qinning Wang	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Rebecca Rockett	Centre for Infectious Diseases and Microbiology-Public Health
	Assoc Prof. Sharon Chen	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Dr Shona Chandra	Centre for Infectious Diseases and Microbiology-Public Health
	Dr Susan Maddocks	Microbial Genomics Laboratory, Institute of Clinical Pathology and Medical Research, NSW Health Pathology
	Prof. Vitali Sintchenko	Centre for Infectious Diseases and Microbiology-Public Health
	Dr Winkie Fong	Centre for Infectious Diseases and Microbiology-Public Health
Case Study 7: Managing the first outbreak in rural and remote NSW during the Delta wave	Priscilla Stanley	Health Protection, Western NSW Local Health District

Title	Contributors	
Case Study 8: Establishing a cultural governance model to support public health actions in Hunter New England LHD	Charlee Law	Hunter New England Local Health District
	Katie Brett	Hunter New England Local Health District
	Kristy Crooks	Hunter New England Local Health District
	Kylie Taylor	Hunter New England Local Health District
Case Study 9: Enhancing community engagement during COVID-19 in Western Sydney: an equity engagement model	Belinda Duckworth	Centre for Population Health, Western Sydney Local Health District
	Elissa Miller	Centre for Population Health, Western Sydney Local Health District
	Dr Robyn Newson	Centre for Epidemiology and Evidence, NSW Ministry of Health
Case Study 10: Using research evidence to inform public health response in childcare and education settings	Dr Andrew Milat	Centre for Epidemiology and Evidence, NSW Ministry of Health
	Dr Archana Koirala	National Centre for Immunisation Research and Surveillance
	Dr Caroline Sharpe	Office of the Chief Health Officer, NSW Ministry of Health
	Dr Jeremy McAnulty	Public Health Response Branch/Health Protection NSW, NSW Health
	Dr Kerry Chant	Population and Public Health, NSW Health
	Prof. Kristine Macartney	National Centre for Immunisation Research and Surveillance
	Marnie O'Brian	NSW Department of Education
	Assoc Prof. Nicholas Wood	National Centre for Immunisation Research and Surveillance
	Dr Sally Ellis	Public Health Response Branch/COVID Influenza Branch, NSW Health
	Trish van Tussenbroek	NSW Department of Education
	Dr Victor Carey	Public Health Response Executive, NSW Ministry of Health
Case Study 11: 'RAC-off COVID': COVID-19 preparedness in local aged care facilities in Western NSW	Anne Field	Western NSW Local Health District
	Priscilla Stanley	Western NSW Local Health District
Case Study 12: Staff and patient COVID-19 risk matrices and public health management for correctional and youth justice settings	Camilla Lobo	Justice Health and Forensic Mental Health Network
	Colette Mcgrath	Justice Health and Forensic Mental Health Network
Case Study 13: Contribution of NSW training programs to the NSW public health response workforce	Ashleigh Armanasco	Public Health Response Branch, NSW Health
	Dawn Arneman	Centre for Epidemiology and Evidence, NSW Ministry of Health

Title	Contributors	
Case Study 14: Rapid establishment of the Venue Management Team in PHRB	Simon Willcox Trish Wills	Public Health Response Branch, NSW Health Public Health Response Branch, NSW Health
Case Study 15: Reaching high priority clinical groups through trusted advice: information update webinars with the Chief Health Officer	Julia King Julie Letts	Office of the Chief Health Officer, NSW Ministry of Health Centre for Epidemiology and Evidence, NSW Ministry of Health
Case Study 16: Developing enhanced surveillance of adverse events following COVID-19 immunisation in NSW	Dr Claire Larter Dr David Durrheim Elspeth Kay Dr Emma Goeman Dr Isabel Brouwer Dr Isis Maitland-Scott Dr Joanna Sutherland Mareeka Hair Assoc Prof. Nicholas Wood Dr Sonya Ennis	Therapeutic Goods Administration Health Protection, Hunter New England Local Health District Therapeutic Goods Administration National Centre for Immunisation Research and Surveillance NSW Health Pathology Health Protection NSW, NSW Health Health Protection NSW, NSW Health Health Protection NSW, NSW Health National Centre for Immunisation Research and Surveillance Health Protection NSW, NSW Health
Case Study 17: COVID-19 'Help us save lives / Help us stop the spread' citizen safety campaign	Ministry of Health Communications Team	Strategic Communications and Engagement, NSW Ministry of Health
Case Study 18: COVID-19 Staying Safe business campaigns	Ministry of Health Communications Team	Strategic Communications and Engagement, NSW Ministry of Health
Case Study 19: Connecting available data and systems to respond to COVID-19: implications for real-time monitoring of hospitalisations and impact on public health decision making	Dr Andrew Milat Aurysia Hii Paula Spokes	Centre for Epidemiology and Evidence, NSW Ministry of Health Centre for Epidemiology and Evidence, NSW Ministry of Health Public Health Response Branch, NSW Health
Case Study 20: Investment in surveillance tools: the SIGNAL program	Dr Andrew Milat Aurysia Hii Lina Persson Paula Spokes	Centre for Epidemiology and Evidence, NSW Ministry of Health Centre for Epidemiology and Evidence, NSW Ministry of Health Centre for Epidemiology and Evidence, NSW Ministry of Health Public Health Response Branch, NSW Health

Title	Contributors	
Case Study 21: COVID-19 wastewater monitoring	Dr Andrew Milat	Centre for Epidemiology and Evidence, NSW Ministry of Health
	Danielle Campbell	Centre for Epidemiology and Evidence, NSW Ministry of Health
	Dr Richard Broome	Health Protection NSW, NSW Health
Case Study 22: NSW vaccine effectiveness study	Assoc Prof. Bette Liu	National Centre for Immunisation Research and Surveillance
	Assoc Prof. Heather Gidding	National Centre for Immunisation Research and Surveillance
Case Study 23: Rapid establishment of the COVID-19 Information Call Centre by the Centre for Population Health, NSW Ministry of Health	John Ward	Centre for Population Health, NSW Ministry of Health
	Megan Cobcroft	Centre for Population Health, NSW Ministry of Health
Case Study 24: Teledentistry in Western NSW Local Health District	Dr Heather Cameron	Western NSW Local Health District
Case Study 25: Re-orienting the Opioid Treatment Program to meet the challenges of COVID-19	Dr Adrian Dunlop	Hunter New England Local Health District
Case Study 26: Development of the *Healthy and Active for Life Online* program for older adults	Dee Upton	Centre for Population Health, NSW Ministry of Health
	Lauren Chuter	Centre for Population Health, NSW Ministry of Health
Case Study 27: Pivoting Health Protection NSW branches to support local public health unit responses to significant infectious disease threats during the COVID-19 pandemic	Keira Glasgow	Health Protection NSW, NSW Health
	Ellen Donnan	Health Protection NSW, NSW Health
	Dr Steven Nigro	Health Protection NSW, NSW Health
Case Study 28: COVID-19 'stop and stay' rapid risk assessment for homeless people in Eastern Sydney	Jody Houston	Public Health Unit, South Eastern Sydney Local Health District
	Toni Cains	Public Health Unit, South Eastern Sydney Local Health District
Case Study 29: Supporting businesses to provide COVID-safe environments	Dr Richard Broome	Health Protection NSW, NSW Health

Appendix E

Additional case studies

CASE STUDY 1
The Northern Beaches outbreak: an explosive COVID-19 outbreak linked to two superspreading events controlled by timely case and contact investigations, targeted community movement restrictions and a strong community commitment to testing

By the middle of December 2020, COVID-19 cases in NSW were almost completely restricted to overseas travellers in hotel quarantine. NSW was looking forward to further easing of public health restrictions ahead of the end-of-year festive season. However, on 16 December the Northern Sydney Public Health Unit was notified of two confirmed COVID-19 cases among Avalon Beach residents. The cases knew each other, but the source of their infections was unknown. There was a rapid escalation in cases reported from the area, with approximately 20 cases notified each day for the next four days.

Rapid 'upstream' investigations revealed that two social events held at two local community clubs in the middle of December were the source of the outbreak. While no index case could be identified, these two superspreading events were responsible for a growing number of cases then linked to smaller clusters elsewhere in the Northern Beaches Local Government Area (NBLGA). The risk of spread to other areas in Sydney and beyond was clear.

Key outbreak control measures included intensive case and contact tracing conducted by the Northern Sydney Public Health Unit with the assistance of public health units from other NSW local health districts, and investigations of venues linked to cases. NBLGA residents were advised to restrict their movements as much as practical and get a COVID-19 test if they developed symptoms. This resulted in a phenomenal community response with an estimated 40% of residents tested by day 5 of the outbreak. With the rapid escalation in cases, a 'stay-at-home' public health order was issued on 19 December. Given the geographical location, this order was able to be restricted to NBLGA residents.

A total of 151 confirmed cases were epidemiologically linked to this outbreak. Whole genome sequencing of samples linked a further 13 cases across NSW to the cluster. Whole genome sequencing also identified the outbreak virus as an Alpha variant which had been reported from the USA at the same time, but no link to travellers from that country could be established.

This outbreak highlighted the capacity for large gatherings at social functions to become COVID-19 superspreading events. However, the very strong public health network response, together with localised community movement restrictions and strong community engagement, led to the successful containment of this explosive outbreak within four weeks of the initial case. This also meant it was not necessary to extend the NBLGA public health order to other areas of Sydney or NSW, with the order being repealed on 9 January 2021.

CASE STUDY 4

An outbreak of COVID-19 in a large meal kit factory in Sydney, Australia

The Delta variant of the SARS-CoV-2 virus caused a marked upsurge in COVID-19 cases in Western Sydney in mid-2021 and was accompanied by a large outbreak in one of the largest food processing plants. Innovative methods were used to identify cases, halt the ongoing epidemic, and ensure that the plant was protected from future outbreaks.

The plant was run by a major food packaging and delivery company employing approximately 350 people, of which a high proportion were casual workers. Eighty-seven percent of staff came from parts of Sydney identified at the time with elevated COVID-19 case numbers. Production floor areas were refrigerated at between 4 and 5°C. During their shifts, workers stood side-by-side approximately one metre apart.

Recognising the high risk of transmission, the company instituted worker temperature and symptom screening on entry to the plant and soon after mandated the use of surgical masks and gloves as personal protective equipment.

The first two positive cases identified were confirmed to have been at work during their infectious period. In response, the company required all workers who had been within 10 metres of a positive case for more than 15 minutes to isolate for 14 days. They required all other workers on the same shift as a confirmed case to leave work, be PCR tested, and to isolate until they had received a negative result.

To control the outbreak some production lines were closed, production was transferred to less crowded assembly lines, and a night shift was introduced. A vaccination drive resulted in over 75% of the workforce being vaccinated by the end of August. Rapid antigen testing of all employees entering the workplace was introduced on 22 August. Mandated mask wearing compliance rates were low at first, however, after a series of efforts to increase uptake, mask usage became ubiquitous throughout the plant. Newly reported cases had declined dramatically by the end of August.

This large outbreak was likely attributed to a number of factors, including moderate physical labour, crowded production floor, cold environment, casual workforce drawn from communities with high background levels of COVID-19, and high numbers of asymptomatic staff attending work during their infectious period. Actions including masks, changed working practices and schedules, vaccination, and education finally brought the outbreak under control.

This case study demonstrates the importance of proactive implementation of a range of interventions to reduce the likelihood of respiratory epidemics in refrigerated food processing and packaging workplaces.

CASE STUDY 28
COVID-19 'stop and stay' rapid risk assessment for homeless people in Eastern Sydney

A multi-agency response – the Complex Vulnerable Populations Team (CVPT) – was coordinated by the South Eastern Sydney Local Health District (SESLHD) Public Health Unit (PHU), including the Department of Communities and Justice (DCJ), St Vincent's Homelessness Health Team, Kirketon Road Centre, the SESLHD Priority Populations Homelessness Health Team, the SESLHD Senior Staff Specialist of Drug & Alcohol, and SESLHD senior environmental health officers.

Following notification of a positive case in a shelter or temporary accommodation hotel, an immediate 'stop and stay' verbal direction was issued by the PHU and an outbreak management team meeting called with representatives of the CVPT. A rapid onsite testing response was implemented to overcome barriers to accessing public testing clinics for this population and to incentivise testing participation through offering food vouchers valued between $10 and $25. The 'stop and stay' remained in place until results were received and a risk assessment was completed, usually 12-24 hours post-notification. It put a hold on anyone leaving or entering and was administered by way of cooperation and communication from DCJ and the accommodation management. The risk assessment included a review of floor plans, CCTV, and case and onsite staff interviews to enable a rapid assessment of the level of exposure.

The outcome for those who tested negative to COVID-19 on their day 1 swab fell into one of three contact categories: CLOSE, CASUAL or MONITOR FOR SYMPTOMS. This, in turn, informed their risk for contracting COVID-19 and their need to isolate. Most commonly, once a case was removed the 'stop and stay' was lifted and all occupants were issued with a notification that they were casual contacts, with a small proportion (perhaps people known to have shared a lift or been in conversation with a case) classified as close contacts. Due to the collaborative strengths of the CVPT it was rarely deemed necessary for an entire hotel or shelter to have a prolonged lockdown.

The CVPT proved to be a highly valuable collaboration and coordination of agencies to assess population risk by location and to minimise spread, disruption, and the costs and trauma of a building lockdown. Later, the CVPT re-oriented the onsite swab team to also offer onsite vaccination to this vulnerable population.

The project demonstrated that DCJ and NSW Health share common goals and can work well together to benefit the vulnerable in local communities. The project also highlighted that PHU risk assessment needed adaptation to respect the differences and complexities of people experiencing homelessness.

A key recommendation from the project is that greater consideration should be given to complex vulnerable populations in future public health orders and emergency responses, and that standard emergency management training should include consideration of complex vulnerable populations.

CASE STUDY 29

Supporting businesses to provide COVID-safe environments

The NSW Minister for Health issued a number of orders from 16 March 2020 that placed increasingly tight restrictions on public gatherings. By 26 March, most public premises in NSW were closed, including cafes and restaurants, pubs and clubs, sports facilities, cinemas and theatres. Places of worship were also closed to the public, except to allow for small weddings and funerals.

A gradual reopening of public premises began in July 2020. To reduce the risk of this reopening, the NSW Government required each business to develop a COVID-19 Safety Plan that addressed matters in a checklist approved by the Chief Health Officer. The checklists were created by NSW Health and covered the key areas of excluding people who were unwell with COVID symptoms, promoting good hygiene and maintaining physical distance. Specific checklists were developed for many categories of business or activity. Due to the speed of the rollout of these checklists, there was limited community engagement in the development of the initial versions. This sometimes led to industry concerns about the feasibility of the requirements. However, relationships with relevant government and industry stakeholders soon developed, improving consultation and implementation.

Initially, only Environmental Health Officers of NSW Health were authorised to enforce compliance with public health orders. This was a small workforce and so authorisation was rapidly rolled out to officers of the NSW Food Authority, SafeWork NSW and Liquor and Gaming NSW. As well as increasing the size of the workforce available to support businesses, this approach meant that agencies were engaging with stakeholders with whom they already had a relationship. An overarching interagency committee was established to coordinate compliance activities and to provide feedback to NSW Health on the implementation of the checklists.

Overall, the approach was a success, with the large majority of businesses able to demonstrate that they had a COVID-19 Safety Plan that they were implementing effectively.

NSW MINISTRY OF HEALTH
1 Reserve Road
St Leonards NSW 2065
Tel. (02) 9391 9000
TTY. (02) 9391 9900

NSW GOVERNMENT

SHPN (CEE) 220757