Deloitte.

AUSTRALIAN Pathology

Review of the impact of the Pathology Sector Response to the COVID-19 Pandemic

Australian Pathology

APRIL 2023

Acknowledgement of Country

The authors acknowledge the Aboriginal and Torres Strait Islander peoples as the traditional custodians of the lands on which we work and live. We recognise that connection to Country is central to the life of First Nations peoples and that through caring for the land peoples are enriched in their mental, physical and spiritual wellbeing.

We pay our respects to their cultures, Elders past and present and honour their continuing connection to land, waters and community.

Contents

Executive Summary	04
01 | Context	10
02 | Overview of Australia's Pandemic Response	12
03 | How did the pathology sector help to achieve this?	14
04 | Australian Jurisdictional and international response	19
05 | The impacts of the Australian pathology sector's response	27
06 | Future of pathology in a post-pandemic health system	33
07 | References	37

Executive Summary

Context

Since the start of the pandemic, health systems around the world have worked tirelessly to protect their populations. Australia has responded well compared to most other countries.

Rapid mobilisation of scientific expertise, technological innovation and operational redesign have characterised the way an agile and effective response to the COVID-19 crisis was managed by the Australian Pathology Sector.

The existence of a strong private pathology sector to rapidly scale testing capability and the collaboration between public and private healthcare providers was a significant contributor to the country's pandemic containment strategy.

Without an effective pathology testing response, case numbers, public health strategies, morbidity and mortality would all have been significantly different to what we experienced.

Deloitte was engaged by Australian Pathology to conduct a rapid review of the impact of the pathology sector response to the COVID-19 pandemic.

Overview of Australia's pandemic response

Australia's pandemic response leveraged our natural advantages – an isolated island far away from large population centres, the ability to close international borders, a highly developed public and private healthcare system, an excellent public health infrastructure and involvement of the private sector to deliver the majority of testing.

The strategy employed in the early phases of the pandemic was to contain the spread of COVID-19, limit case numbers and try to buy time for a vaccine or antiviral therapy to become available.

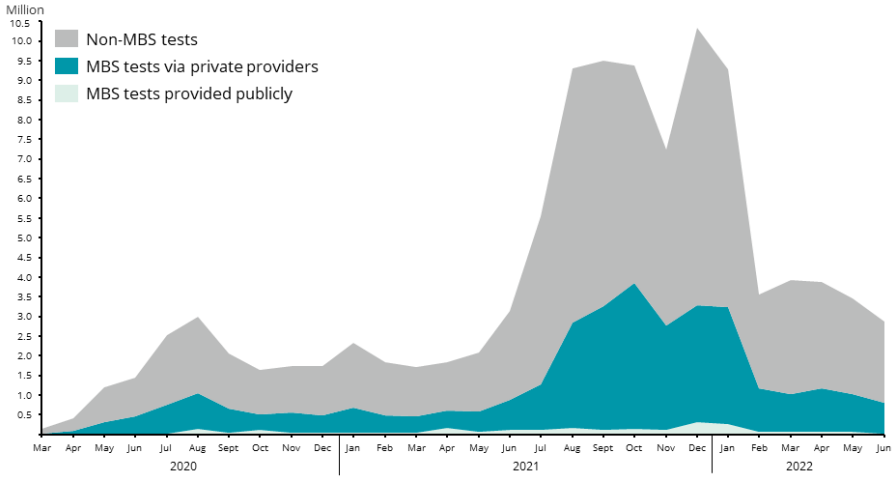
That strategy relied heavily on the ability to provide rapid and accurate testing of symptomatic individuals and asymptomatic when requested to enable case isolation, contact tracing and therapeutic intervention where required.

The Australian pathology sector collectively provided 73 million PCR tests from April 2020 to June 2022. Approximately 70% of all PCR tests undertaken in Australia were performed by private pathology providers.

Australia is one of only a small number of comparable countries to have kept cases and deaths at a relatively low level, particularly prior to the widespread availability of effective COVID-19 vaccines.[6]

Over the pandemic, Australia has one of the lowest case fatality rates in the world (0.14%). This is 6-8 times lower than comparable jurisdictions (U.S 1.1%, Canada 1.06%, U.K 0.87% - Johns Hopkins Coronavirus Resource Centre).

Total PCR Tests Count



Total PCR is sourced from Covidlive, [9] where the grey coloured proportion above represents non-MBS subsidised tests. A total of 73.0 million PCR tests were performed from beginning of the pandemic to June 2022.

34.4 million of the total of 73.0 million tests were subsidised by the MBS during the same period. [8]

MBS data is sourced from Medicare Statistics.

How did the pathology sector help to achieve this?

The response of the pathology sector was built around four key streams of activity.

Providing the ability to rapidly scale and deliver efficient pathology services

Unlike comparator countries, Australia had well-established networks of both public and private pathology providers. Private providers were able to leverage existing collection centres and laboratories, and invested in digital technologies to build additional capacity to meet the huge surge in demand for PCR testing.

Providing timely and equitable access to disadvantaged populations

Co-existence of public and private pathology providers enabled a comprehensive network for collection and testing in most metropolitan locations. The private pathology sector became the key provider of PCR testing for disadvantaged populations including indigenous communities and people in rural and remote communities, with rapid establishment of new collection centres and testing facilities.

Providing faster turnaround time in test reporting

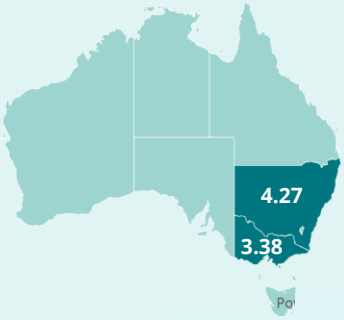
Rapid turnaround of PCR test results is critical in detecting and containing the outbreaks within specific locations prior to the occurrence of cross-regional transmissions. New investment in enhanced IT systems supported COVID-19 drive-through centres, data entry and SMS results.

Collaborating and mobilising resources to respond to key testing challenges

Leveraging both public and private pathology capacity was critical in Australia's initial response to the pandemic. Private pathology companies invested capital to ramp up equipment, acquire reagents, expand workforce and establish collection and testing centres around the country. The providers successfully managed to procure and distribute inventory such as PPE, collaborating with state and national government.

Australian jurisdictional and international response

One of the features of the Australian pandemic response that distinguished it from other countries was the significant level of cooperation across levels of government. Under the leadership of the National Cabinet that brought together heads of Federal and State governments, and health departments across the country, Australia coordinated its initial approach to the pandemic better than many. The New South Wales and Victorian examples are outlined below.



NEW SOUTH WALES

NSW had **4.27** PCR testing per capita, one of the highest in Australia. This allowed the government to take the appropriate measures, with the State being the main point of incursion of international cases coming from cruise ships and travellers during the initial stages of the pandemic.

VICTORIA

High testing rates (PCR tests per capita ratio of **3.38**) in Victoria were critical in informing government and policy makers in developing public health orders and restrictions required to contain the spread of COVID-19. Early and rapid detection of cases was critical to informing the timing of public health orders and restrictions, as seen in late 2020 with the State's Roadmap to Reopening, predicated on specific conditions being met around community transmission (i.e. reduced case or no new cases).

International Response

UK Response

At the heart of UK's response to COVID-19 pandemic was the NHS Test and Trace Programme. The programme is government-funded and established and set up by the Department of Health and Social Care from Public Health England.

The first phases of the pathology response during the pandemic in the UK was slower where the NHS Test and Trace Programme was only established when the national daily cases had risen to 2,000 a day. This made it more difficult to achieve timely contact tracing aided by pathology PCR testing to limit the outbreak.

In contrast to Australia, at the initial onset of the pandemic, pathology testing in the UK for COVID-19 other than in hospitals was halted due to a lack of testing capacity in the community. The disaggregated nature of the UK pathology sector meant that pathology providers were required to collaborate and work with various suppliers including commercial laboratories (Lighthouse Labs) and logistics services (such as Amazon) to build and maintain testing capacity.

US Response

The US ran into PCR capacity issues earlier than Australia due to a higher case load during the initial waves, putting extra strain on capacity ramp-up and turnaround times in the pathology sector to catch the spread. The US quickly become the epicentre of the pandemic in 2020. This resulted in a blowout in testing turnaround time and led to the earlier shift towards Rapid Antigen Tests (RATs).

An additional lens specific to the US COVID-19 responses is the more complex political environment and varied approaches across 50 states, leading to greater uncertainty and inconsistency in testing.

Canadian Response

The pathology response in Canada was similar to that of Australia. The pathology sector was able to rapidly ramp up PCR testing capacity and ensured there was sufficient capacity to meet the demand during earlier waves.

This was supported by strong government funding and integration of private providers into the response. When Omicron hit the country, it resulted in increased testing demand as the country pivoted its testing strategy towards RATs.

Australia's key COVID-19 figures compared with the UK, US and Canadian jurisdictions:

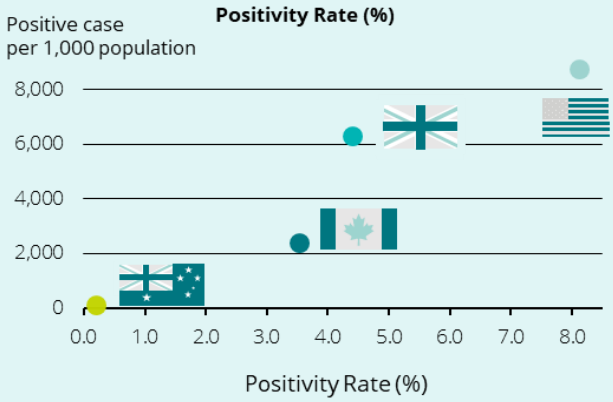
	Australia	UK	US	Canada
Total Population	25.8M	68.6M	331.0M	38.5M
Total Tests	76.9M	502.5M	912.8M	62.2M
Total Positive Cases Reported*	10.2M	22.7M	94.4M	4.2M
Total Deaths Reported	14,029	204,613	1.05M	44,472
Positivity rate	0.2%	4.5%	10.3%	6.8%
Case Fatality Ratio	0.14%	0.90%	1.11%	1.06%
Mortality rate	0.0035%	0.3%	0.32%	0.12%

Data sourced from Covidlive and Our World in Data **from Jan 2020 to end of Aug 2022**
*Total Positive case reported include both self reported and PCR detected.

Compared to international jurisdictions, Australia:

Had the lowest positivity rate at 0.2%

For the initial 12 months after the WHO declared COVID-19 a global pandemic. The threshold recommended by the WHO for a positivity rate considered high is 5%.



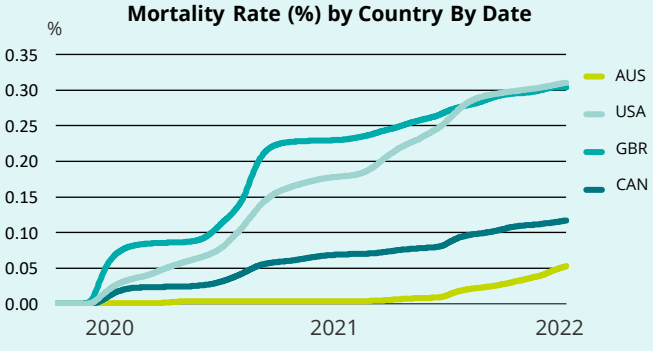
Data sourced from Our World in Data from Jan 2020 to 12th of March 2021.

Detected approximately 92% of all symptomatic cases[14]

The accuracy of PCR testing undertaken by the Australian pathology sector enabled the country to endure the early stages of the pandemic with lower death rates than seen in comparable jurisdictions.

Had the lowest mortality rate at 0.0035%.

Higher rates of PCR testing in Australia allowed effective case detection, tracing, treatment and isolation that was not possible in the comparator countries that did not have effective pathology sector responses.

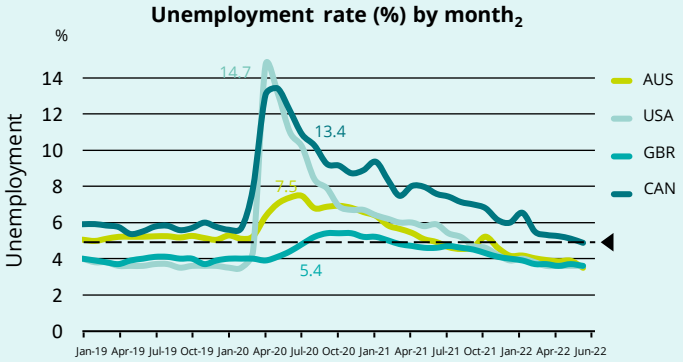


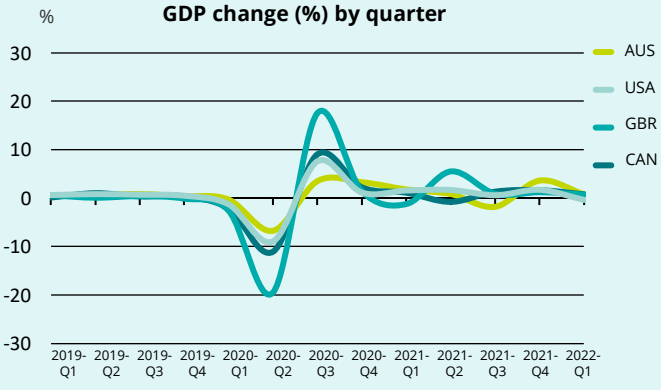
Had the lowest transmission rate

Demonstrated by the lowest arithmetic mean of Reproduction Rate (R0). The Australian public health response, which was based upon widespread availability of PCR testing, was much more effective than in those countries with less effective pathology sector responses.

Was able to rebound quicker to pre-pandemic levels, in 15 months

Faster community transmission and lower PCR testing resulted in deeper economic downturns in some countries, with the US and Canadian unemployment rates peaking at nearly 15% and over 13%, respectively. Labour markets in these countries took much longer to rebound to pre-pandemic levels than in Australia – the US and Canada took 25 and 24 months, respectively.





2Source: Australian Bureau of Statistics, Labour Force, Australia for previous 5 year period from July 2017 to June 2022 [47]; Office for National Statistics, Labour Force Statistics [48]; U.S. Bureau of Labor Statistics, Labor Force Statistics from the Current Population Survey[49]; Statistics Canada, Labour force characteristics by province, monthly, seasonally adjusted.[50]

The impacts of the Australian Pathology sector's response

The impacts of the Pathology sector's response can be broken into four main categories.

Reduced community spread of COVID-19	Adequacy and availability in pathology testing levels, low positivity rate and rate of transmission have clearly demonstrated its positive impact and value in detecting and controlling outbreaks, and in informing interventions leading to reduced positive cases in the community.
Improved health outcomes	Numerous studies have demonstrated the importance of early diagnosis in allowing rapid isolation, reduction in transmission and improved outcomes from treatment in high-risk individuals. PCR testing remains the gold standard for the early diagnosis of COVID-19 and is a critical component of treatment algorithms guiding early access to anti-viral medication, hospitalisation, oxygen therapy and intensive care management.
Supported our communities and the economy	Australia's low positivity rate allowed most state jurisdictions to relax restrictions relatively early, which facilitated a quick rebound in economic activity. States were able to implement targeted measures such as border restrictions and "snap" lockdowns that allowed minimal disruption to economic activity in states such as WA and QLD. Without adequate testing capacity provided by the pathology sector, the initial lockdowns and state specific restrictions would likely have been significantly longer. It is unclear that indefinite government subsidises would have been possible under such a scenario and it is probable many more businesses would not have survived the initial COVID-19 waves. Any subsequent recovery in the labour market would consequently have been much weaker. By June 2021, the total number of employed people in Australia had exceeded pre-COVID-19 levels. We also saw consumer mobility rebound strongly and a quick recovery to household spending.
Protected hospitals and public health system	Accurate and timely diagnosis from pathology testing helped to minimise the severity of the disease from progressing to the state requiring hospitalisation and intensive care treatment. This was critical to prevent the healthcare system from being overwhelmed and to ensure adequate capacity (i.e. number of hospital beds available) to respond to emergency care needs from the community. Through maintenance of high rates of community testing, and low rates of community transmission of COVID-19, Australian hospitals and their workforce were not infected en-masse as they were elsewhere, and we did not see high numbers of deaths and morbidity amongst health workers.

Future of pathology in a post-pandemic health system

In the post-COVID-19 era, the pathology sector will be vital in supporting improved diagnostics, life-long personalised wellness management, genomic based therapies and public health protection.

Next variant could emerge at any point

Given the unpredictability of when and how an infectious variant of SAR-CoV-2 will emerge, a robust, agile and responsive surveillance system aided by pathology testing and contact tracing is critical to identify the spread of existing and evolving sub-variants to protect communities. Mutation studies indicate that the time taken for potential pandemic viruses to emerge has significantly shortened.[3]

It is likely that Australia will be faced with another pandemic in the future and ensuring the existence of a strong pathology sector is vital in preparing for that eventuality.

Demand for healthcare is likely to continue to grow

Pathology plays a crucial role in preventative healthcare through early detection and diagnosis. This can often help prevent more acute health problems from developing and reduce the overall cost to the healthcare system.

There is a need to re-imagine the health delivery models of care and increase focus on early detection and prevention of health problems to reduce the system wide workforce and economic constraints.

An efficient and effective pathology sector is critical to preparedness

The ability to rapidly scale pathology testing is essential to pandemic readiness. This includes adequate network of collection centres, testing laboratories and skilled workforce, together with the existence of strong public and private pathology providers.

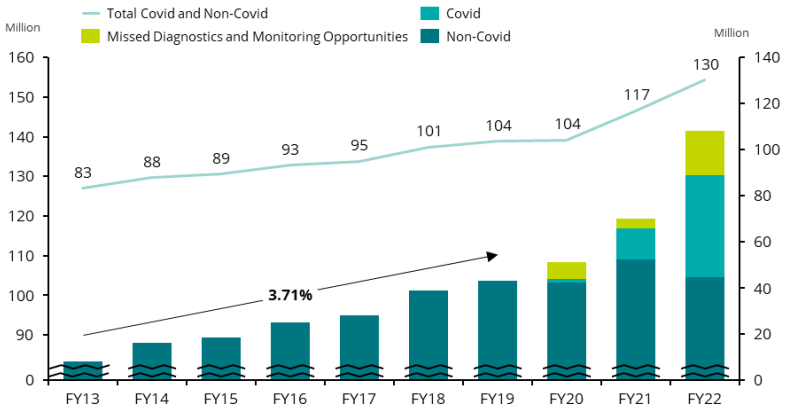
Risks arising from tests not performed during the pandemic

Historically, non-COVID-19 MBS testing was growing at a rate of 3.71% p.a. prior to the pandemic (FY13 to FY19).

There was a significant drop in non-COVID-19 testing services in FY20 to FY22 (as many as 17.9 million non-COVID-19 pathology tests were not performed during the pandemic due to lockdowns). This includes cancer screening and monitoring tests, and represents a significant risk of longer-term health impacts on the community.

The missed diagnostics and monitoring opportunities of non-COVID-19 tests will likely manifest in increased acute presentations and chronic disease burden, downstream in the healthcare system over the coming years.

MBS Services Count and Growth Rate



The graph above sources data from MBS from the year July 2013 to June 2022.

Healthcare is becoming increasingly personalised

The pathology sector will face increased demand over the next five years due to the aging population, increasing health awareness, and postponed GP health check visits and elective surgery as a result of the pandemic.

Technological development in the sector has increased both the testing capacity, by introducing scalable and automated testing processes, and the range of tests on offer to the public including whole genome sequencing, cognitive health testing and artificial Intelligence aided histopathology.

Personalisation of diagnosis and lifetime risk management to maintain wellness, and genomic supported personalisation of therapeutic choices will become the norm in healthcare delivery. These modalities will rely on well-resourced and responsive pathology providers to deliver optimal patient outcomes.

01 | Context

Services provided by the Pathology Sector have been a key component of the public health response in Australia and around the world. Rapid mobilisation of scientific expertise, technological innovation and operational redesign have characterised the way an agile and effective response to the COVID-19 crisis was managed by the Australian Pathology Sector.

The existence of a strong private Pathology Sector, and the collaboration between public and private healthcare providers, was a significant contributor to the pandemic containment strategy in Australia that enabled the country to weather the early stages of the pandemic without the high death rates seen in some comparable jurisdictions. The rapid mobilisation of effective testing capabilities and capacity in Australia was better than in other countries studied in this report and provided time for Australia to vaccinate its population without the devastating impacts on the healthcare systems and society seen in other parts of the world.

Report Objectives

This report seeks to:

- Quantify the services delivered by the pathology sector in Australia;
- Describe the impact of that response on the health system;
- Describe the impact of that response on our communities;
- Describe the impact of that response on the broader economy; and
- Compare the Australian pathology sector response to the U.S, U.K, and Canadian responses.

Lessons learned are reviewed in the context of the future direction of healthcare in Australia and the Pathology Sector's ongoing role within it.

Pathology Sector Background

Pathology testing is the foundation of modern healthcare. If you have ever had a blood test, biopsy or a swab, you have received services from a pathologist, delivered in a pathology laboratory. It allows patients to receive timely diagnosis and treatment, as well as optimal management of chronic disease. Approximately 70% of medical diagnosis requires pathology tests and 100% of cancer diagnosis requires pathology testing.[4]

Within the Australian health system, pathology services are provided by both public health systems and private pathology providers. Of the total COVID-19 polymerase chain reaction (PCR) tests undertaken in Australia, approximately 30% of the tests were performed by the public sector and 70% by private pathology providers (due to limited data on private and public splits on non-MBS data, collective and average percentage representations has been used to approximate the private proportion of non-MBS data).

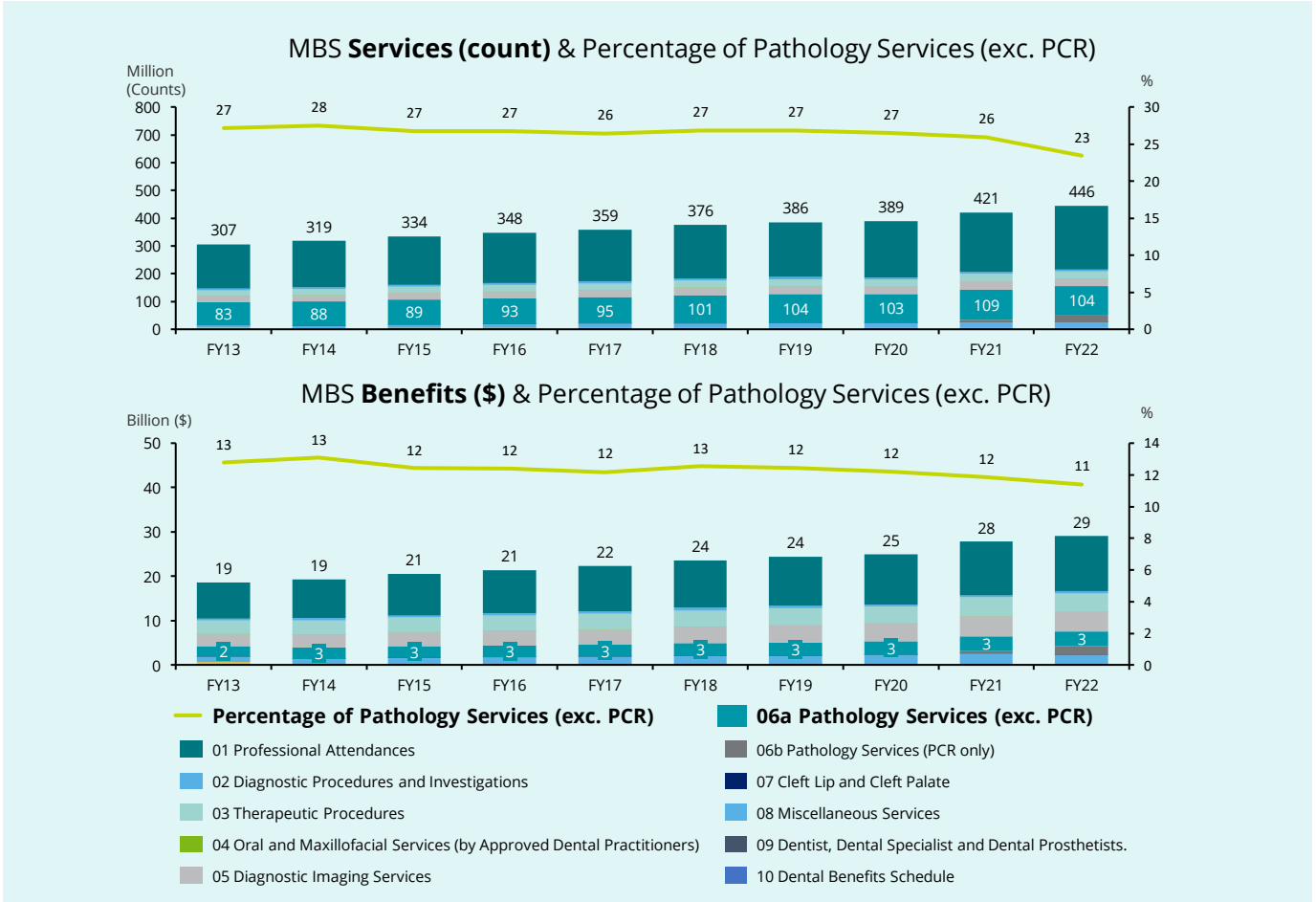
The relative proportion of public and private pathology service providers differs amongst comparable countries (U.S, U.K and Canada), with resultant differences in levels of technology innovation, supply chain and collection logistics, and available laboratory capacity. This variability in pathology sector design was visible during the global COVID-19 pandemic, with resultant differences in the ability to effectively launch containment strategies informed by appropriate pathology testing.

Technological and scientific advances within the pathology sector have impacted both

the range of diagnostic tests available, turnaround times, and the role of pathology testing in guiding treatment options for patients with severe (cancer), acute (COVID-19) and chronic disease (diabetes, heart failure, renal failure).

The advances made in diagnosis and treatment on the basis of pathology tests will undoubtedly lead to growing demand for these services, as evidenced by the increase in average number of pathology tests per patient over the past five years, but is likely to reduce requirements for unnecessary tests and treatment, improve patient outcomes and reduce complications for patients as therapy becomes more personalised.

Wise utilisation of pathology testing is likely to be a component of strategies to ensure the fiscal sustainability of health expenditure, through relatively low-cost pathology tests informing more expensive therapeutic interventions such as surgery, chemotherapy and access to pharmaceuticals.



The graph above sources data from MBS and includes services count across all benefits count provided from July 2013 to June 2022.[8]

The graph above represents the total MBS spend on services over the past 10 years. Pathology services count has increased from 27% to 30% of the total services counts. The sector have delivered 100 million average services per annum, with tests performed per person increasing from 3.2 to 5.0 average pathology tests each year.

02 | Overview of Australia's pandemic response

The pathology sector played an essential role in providing COVID-19 testing services, critical to detecting and controlling outbreaks.

It is useful to consider the pandemic in two key phases – the pre-vaccine "containment phase", and the post-vaccine "monitoring phase". During the containment phase the pathology sector played an essential role in providing COVID-19 testing services, critical to detecting and controlling outbreaks.

Commencing in Mar/April 2020 in response to the COVID-19 pandemic, the sector began providing PCR tests. PCR tests detect the presence of SARS-CoV-2, the virus that causes COVID-19, by amplifying its genetic material (ribonucleic acid, RNA) to allow trace amounts to be detected in nasal and throat swab specimens of patients.

PCR testing is considered the gold standard for diagnosing COVID-19.[5] The pandemic has dramatically increased the service requirement for the sector over the past three years.

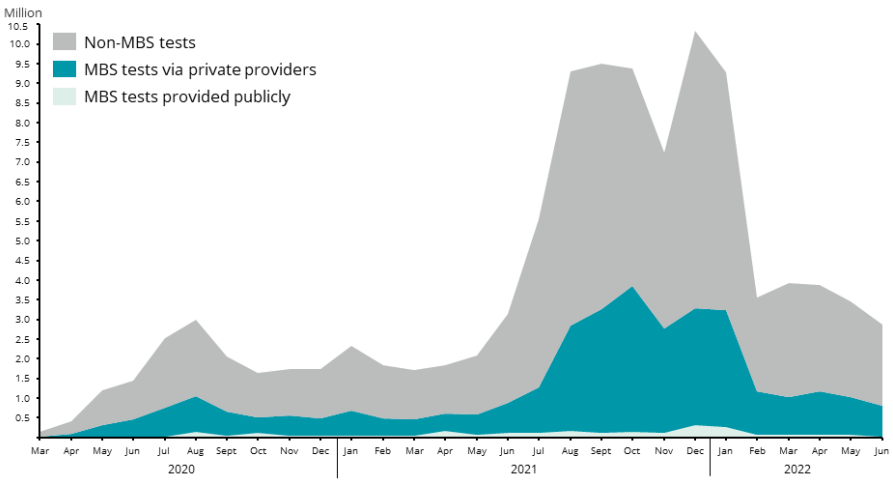
The Australian pathology sector collectively provided 73.0 million PCR testings from the beginning of test reporting till 30 June 2022.

- 34.4 million PCR tests were claimed during this period via MBS SARS-CoV-2 codes for subsidies from the beginning of test reporting till the end of June 2022.
- Of the total 34.4. million MBS subsidised tests, approximately 92.75% of the tests were performed by the private providers, equivalent to approximately 31.9 million PCR tests.
- The remainder of PCR testing which was not claimed through MBS represents 53% of the PCR tests performed, representing tests through both private and state providers and other channels such as Veterans Affairs.
- While public data regarding the provision of non-MBS funded PCR testing is not available, based on data from large private pathology sector providers it is estimated that the private pathology sector provided as much as 70% of the total volume of PCR testing done in Australia, equating to 51.5million PCR tests.

Whilst multiple COVID-19 vaccines have been developed and rolled out to the public, PCR testing will continue to play an essential role in confirmatory diagnosis for SARS-CoV-2 for the foreseeable future. Australia is one of only a small number of comparable countries to have kept cases and deaths at a relatively low level, largely attributable to PCR testing.[6]

Vulnerable patient groups such as the elderly and immuno-compromised will continue to benefit from minimal viral exposure, requiring the pathology sector to maintain adequate levels of availability and accessibility of COVID-19 testing to the public.

Total PCR Tests Count



Total PCR is sourced from Covidlive, [9] where the grey coloured proportion above represents non-MBS subsidised tests. A total of 73.0 million PCR tests were performed from beginning of the pandemic to June 2022.

34.4 million of the total of 73.0 million tests were subsidised by the MBS during the same period. [8]

MBS data is sourced from Medicare Statistics.

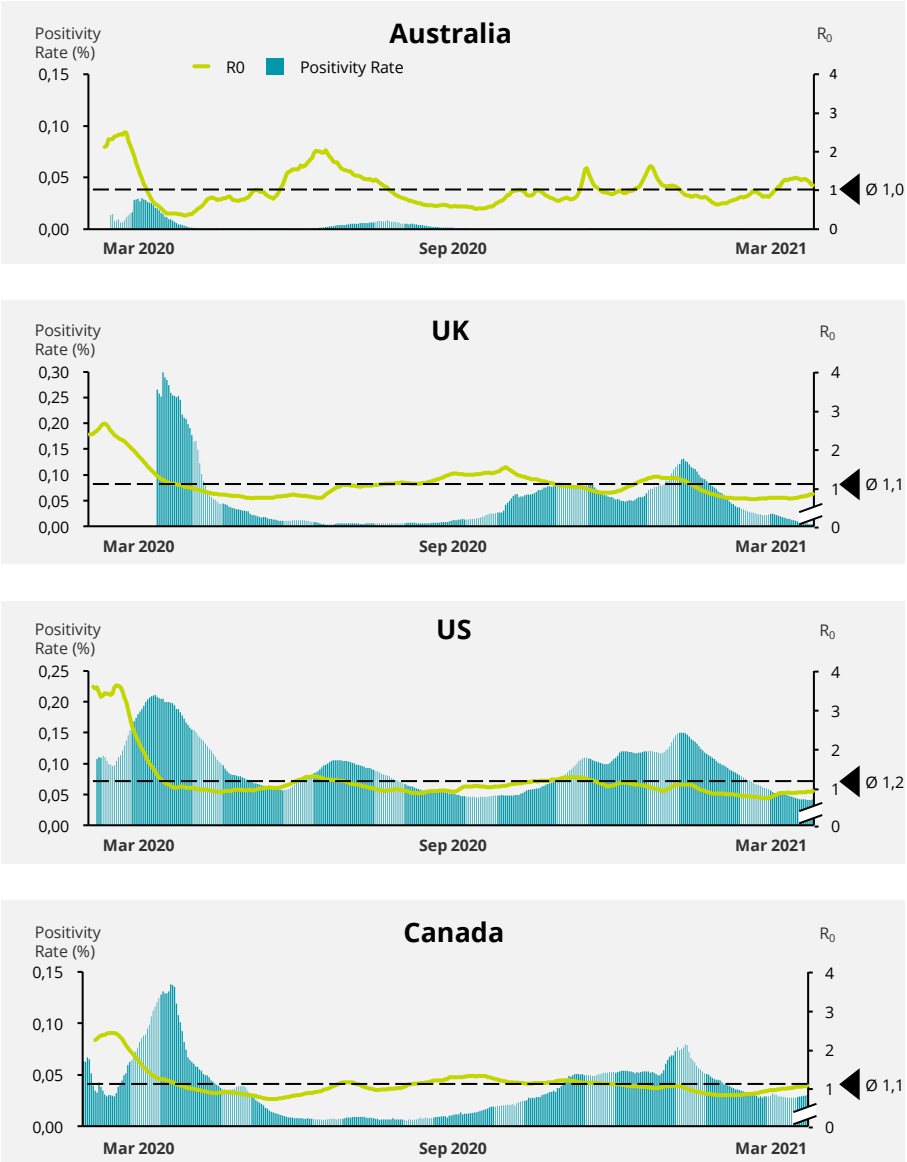
Early in the pandemic it became clear that the contagiousness of the virus and the rate of transmission of COVID-19 from an infected individual to others they encountered was an important measure of the effectiveness of public health controls.

The two metrics used are known as R_0 and R_e.

1. The Reproduction Rate (known as R or R_0) is used to identify the average number of people one person with the disease will likely infect.[10]

It is an estimate of how contagious an infectious disease is based on the biological characteristics of the pathogens and was used to explain the importance of social distancing during the initial period of the pandemic.[11] It is used to predict the extent of immunisation level required for herd immunity and is a critical measure in the early stage of the pandemic.[11]

2. The Effective Production number (known as R_e or R_{eff}) measures the rate of transmission of the virus during the pandemic and is known as the number of people in a population that an infected individual can infect at any specific point of time.[11] R_{eff} can vary as the vaccination level in the mass population increases, either through vaccination or immunity post infection.[11] It is a critical measure to monitor the transmission right through to the endemic stage and adjust public health policies such as masks and social distancing.[11]



Data is sourced from Our World In Data from onset of Covid to 12th of March 2021.

03 | How did the pathology sector help to achieve this?

Leading private pathology providers played a central role in mobilising the adequate testing capabilities, technologies and workforce to meet COVID-19 testing response requirements for Australia, alongside Australian Governments. They did this through providing agile, responsive, and timely testing services; by responding to the urgent needs of indigenous, remote and disadvantaged populations; improving turnaround times for results; and collaborating with public laboratories to optimise resource utilisation.

Case detection via PCR testing, rapid contact tracing and case isolation were the three key public health interventions in Australia aimed at containing case numbers until the development of vaccines provided options for preventing virus spread and acute disease.

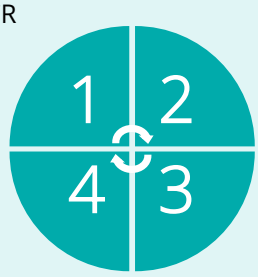
How did pathology help achieve this?

1. Providing the ability to rapidly scale and deliver efficient pathology services

Unlike comparator countries, Australia had well-established networks of both public and private pathology providers. Private providers were able to leverage existing collection centres and laboratories, and invested in digital technologies and infrastructure to build additional capacity to meet the huge surge in demand for PCR testing.

2. Providing timely and equitable access to disadvantaged populations

Co-existence of public and private pathology providers enabled a comprehensive network for collection and testing in most metropolitan locations. The private pathology sector became the key provider of PCR testing for disadvantaged populations including indigenous communities and people in rural and remote communities. Rapid establishment of new collection centres and testing facilities provided important services that the public sector could not provide in a timely manner.



3. Providing faster turnaround time in test reporting

Rapid turnaround of PCR test results is an important step in detecting and containing the outbreaks within the specific locations and preventing cross-regional transmissions. Investments in enhanced IT systems supported COVID-19 drive-through centres, data entry, and results reporting via SMS.

4. Collaborating and mobilising resources to respond to key testing challenges

Leveraging the entirety of public and private pathology capacity was critical in Australia's initial response to the pandemic. Private pathology companies invested capital to ramp up available equipment, acquire reagents, expand workforce and establish new collection and testing centres around the country. The providers successfully managed to procure and distribute the required inventory including PPE and other test essential items, collaborating with state and national government.

1. Providing the ability to rapidly scale and deliver efficient pathology services

In the early stages of the pandemic, it became clear that public pathology services would not have the capacity to manage testing requirements for the pandemic on their own. Private providers were able to leverage their existing network of diagnostic equipment, collection centres and testing laboratories and rapidly scale very significant additional capacity to meet the huge surge in demand for PCR testing.

The private pathology sector utilised its existing supply chains and established new networks which allowed it to procure adequate levels of personal protective equipment (PPE) equipment, PCR machines, testing equipment and essential reagents. The providers were able to rapidly ramp up a network of collection centres and testing laboratories and invest in automation technologies to optimise the testing process. Almost the entire private pathology workforce, including pathologists, collectors, sample couriers, laboratory assistants and administrative staff became actively engaged in meeting the rapidly changing demands of varying lockdown and testing requirements in different jurisdictions around the country. The rapid and agile response provided by both the private and public pathology sectors enabled the high levels of testing that facilitated effective contact tracing, and provided the data required by public health decision makers as they imposed or lifted restrictions.

Case Study

In NSW during the initial outbreaks, the local providers for the disability communities were unable to provide services to vulnerable individuals for over four days.

Private providers were able to establish and mobilise three strike teams within four hours to test vulnerable individuals within high-risk settings to allow support services to resume, where the individuals were without support for over four days. During this time, 600+ tests were generated per day of testing operations.

The agility and efficiency of testing services enabled care workers and other support services to return for the vulnerable group of individuals who are most susceptible to sub-optimised health outcomes by delivering test results within 24 hours through fast and on-site testing facility.

This is critical to protect the vulnerable individuals during the nursing home outbreaks in Western Sydney Local Health Districts and Blue Mountains Local Health Districts between July 2021 to March 2022. Pathology services that are provided for medical staff and patients at hospitals from March 2020 till end of September 2022 is critical to ensure surgical procedures can proceed where urgent intervention is required.

Rapid pathology services allowed individuals in the community to receive test results within a 24 hour turnaround, critical to allowing individuals to receive care and other support services, and protecting the vulnerable communities in need.

2. Provide timely and equitable access to disadvantaged populations

Prior to the pandemic, the co-existence of public and private pathology providers in most cities in Australia had enabled the establishment of a comprehensive network for collection and testing in most metropolitan locations. However, in some areas ready access to pathology services for rural and very remote communities was limited, impacting some of our most vulnerable and disadvantaged populations.

During the pandemic, disadvantaged populations affected than other groups in society. People in low socioeconomic groups were almost 4 times as likely to experience deaths due to COVID-19.[7]

Similarly, international studies from United States and United Kingdom reported high risks of infection and more frequent hospitalisation and intensive care needs in disadvantaged groups than people from higher socioeconomic groups.

Over the course of the pandemic, the private pathology sector established new collection and testing centres to provide access to indigenous and rural and remote communities.

Case Study

During the Shepparton outbreak response in Victoria in August 2021, with less than 24 hours notice, a private provider mobilised a team of 12 people to stand-up, manage and operate several COVID-19 testing locations at the height of the pandemic.

The direct impact of this was that 11,000 of the town's 70,000 population were identified as close contacts and received tests promptly.

The testing coverage extended to Rumbalara Aboriginal Co-Operative in neighbouring Mooroopna, which is home to a significant indigenous population. 3,000 of the 11,000 identified close contacts, which accounted for an approximate 27% of the total close contact identified, were tested in the first weekend of operations in just over 2 days.

Rapid ramp up of testing coverage to the local indigenous population to allow safe easing of restrictions where close contacts were identified and outbreaks contained.

3. Provide faster turnaround time in test reporting

The average pooled incubation period for COVID-19 is 6.57 days, with a range of 2-19 days reported and average incubation time for each variant at 5, 4.5, 4.41 and 3.42 days for Alpha, Beta, Delta, and Omicron.[15] Antiviral medication should be commenced within 48 hours of infection for optimal outcomes, according to a study from the University of Hong Kong and circulated in RACGP guidelines for clinical considerations.[16] The sooner an infection can be identified and isolation, contact tracing and therapeutic interventions established, the lower the rates of transmission, morbidity and mortality.

Rapid turnaround of PCR test results remains a critically important step in detecting and containing COVID-19 outbreaks. It supports early isolation, effective contact tracing and assessment and therapy for infected individuals.

The Australian private pathology sector introduced a number of technological and process innovations to improve timeliness of test completion and reporting. These included IT system enhancements that enabled COVID-19 drive-through centres, efficient data entry and transmission, and results reporting via SMS directly to the patients.

Case Study

During the testing response to the Delta outbreak, Australian Pathology members designed, tested and implemented an automated drive through solution in one week to meet testing demand. The automated drive through solution improves speed of turnaround time by automating the front-end patient registration process, reducing the need for backend data entry and paper request forms in drive throughs. This had also reduced the risk of COVID-19 transmission indirectly with paperless solutions, minimising hygiene related issues. As a result, the majority of test were reported within 24 hours, and the collection time reduced from over 5 minutes to less than 2 minutes per patient at the drive-throughs.

Automation in the collection process has improved the speed of turnaround time and reduced backend data entry requirements, resulting in a more efficient process.

4. Collaborating and mobilising resources to respond to key testing challenges

Whilst the pathology sector received great public support, it was a time of challenges for the sector from procurement of materials and equipment, having the right level and skilled workforce, and the right system and technologies in place to mobilise and deliver the required testing need, all during a time of global supply chain and talent shortage.

The providers successfully managed to procure and distribute the required inventory including PPE and other test essential items, collaborating with state and national government. To meet the workforce demand, providers tapped into local communities for recruitment and provided in-house training to upskill and cross-train existing staff re-deployed for COVID-19 response and newly hired workforce.

Prior to vaccination reaching a critical mass, the only method of managing the pandemic during the initial waves was highly reliant on the pathology test, trace and isolate. The collaborative effort in the pathology sector was critical and has kept communities safe and open during Christmas, demonstrated by pandemic response against the Willunga outbreak in December 2021 in South Australia.

Case Study

In Western Australia, the private sector collaborated with Mineral Resources Limited to establish COVID-19 testing within 48 hours for the mining and resources sector throughout the pandemic.

The operation completed over 200,000 PCR tests and supported 10 mining companies' 80,000+ employee over this period.

The testing operations in place was critical in keeping workers safe and allowing the continued sector operation by minimising disruption during the past 2 years.

Agile and collaborative testing operation in Western Australia for coverage in mining sites kept workers safe, ensured continued sector operation, and sustained mining sector's contribution to the state and national economy.

04 | Australian jurisdictional and international response

Scale of Australian Government support of testing compared to international jurisdictions

Whilst the Australian government supported the initial public health response to the pandemic with a total of $4.9 billion in new funding commitment, there was less direct support for the establishment and scaling up of PCR testing than in other comparable jurisdictions.

UK: The UK Government budgeted £100bn to expand COVID-19 testing to 10million a day.[18] The Testing, Tracing and Isolation (TTO) budget in the financial year 2020-2021 exceeded that of the Home Office, where the programme costed £15.7 billion.[19] The government funding supported the end-to-end operations of standing up the pathology testing programme, from sample collection, logistics and laboratory testing.

US: The US Government also committed to invest more than $12bn to expand pathology testing, using $10bn funds from the American Rescue Plan to ramp up screening testing in helping schools reopen and $2.25bn to scale up testing in underserved populations. Government investment in testing was a critical measure to support an increase COVID-19 testing yet was ultimately shown to be insufficient, given the country's widespread infection and relatively high positivity rates.[20]

Canada: The Canadian Government provided $4.3bn to support its provinces and territories with the costs of increasing capacity to conduct testing, aid contact tracing and to provide data supporting public health measures to combat the pandemic.[21] The investment was critical to support the providers in sustainably ramp up capacity and contain the outbreaks.

COVID-19 Australian national response within a Federated System

One of the features of the Australian pandemic response that distinguished it from several other countries was the significant level of cooperation across different levels of government. Under the leadership of a National Cabinet that brought together heads of Federal and State governments, and with ongoing collaboration amongst health departments across the country, Australia coordinated its initial approach to the pandemic better than many.

Prior to the pandemic, Federal or State level governance and decision-making mechanisms to ensure a single coordinated response to the pandemic with the wider health system did not exist. This was equally true within the pathology sector, and initial attempts by the public health system to manage the entirety of the pathology response required was soon found inadequate to deal with the scale of the challenge presented by COVID-19.

State and territory pandemic response

The federated nature of government in Australia meant that at times there were different strategies employed by States and Territories to manage the pandemic within their own jurisdiction. This was partly the result of the different levels of community transmission of COVID-19, although was also the result of inherent differences in governance, capabilities, funding approaches and appetite for public-private collaboration in different jurisdictions. NSW and VIC delivered the highest testing per capita at 4.27 and 3.38 (PCR test per person, calculated form total PCR tests performed by state over state population) despite the two states being most populated and facing additional challenge with outbreaks introduced by infected international travellers.

Comprehensive testing and results reporting became the mainstay of public commentary by public health officials and government representatives in providing the community with information about the extent of the response efforts and the success of containment measures in each jurisdiction.

The graph and tables below show figures representing testing conducted from the initial COVID-19 reporting to12th of March 2021, one year after the WHO declared COVID-19 a pandemic.

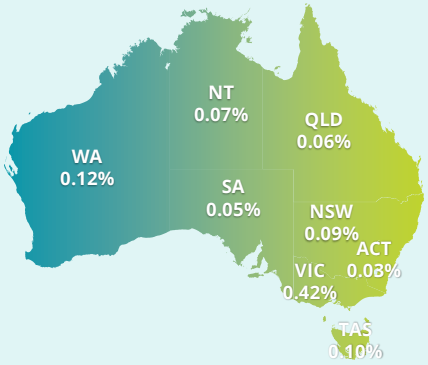
During this period, the containment strategy focused on detection, contract tracing and isolation to reduce transmission and prevent widespread outbreaks. All the public health measures relied heavily on PCR testing and required a rapid private sector pathology ramp up and its timeliness in reporting.

Australia had an extremely low mortality rate throughout the pre-vaccine containment phase of the pandemic

(national average of 0.004%). This was associated with a lower PCR test positivity rate at 0.2% than other comparable jurisdictions as a result of the high volume of PCR testing undertaken and the effectiveness of this in supporting the public health interventions.

Containment Pre-vaccine – till 12 March 2021

State PCR Positivity Rate



National statistics pre-vaccine

0.20% National PCR Positivity Rate

0.004% National Mortality Rate

	ACT	NSW	VIC	WA	SA	QLD	NT	TAS	Grand Total
Total PCR Tests	174,039	5,101,487	5,116,005	645,458	1,109,985	1,996,346	133,277	178,836	14,455,43
PCR Test Positive Cases	56	4,550	21,661	780	500	1,100	90	172	28,90
State Population ('000)	453.3	8,095.4	6,559.9	2,762.2	1,806.6	5,265	249.3	569.8	25,761.5
Total Deaths	3	54	820	9	4	6	0	13	909
Avg PCR Tests Per Person	0.38	0.63	0.78	0.23	0.61	0.38	0.53	0.31	0.56
PCR Test Positivity Rate	0.03%	0.09%	0.42%	0.12%	0.05%	0.06%	0.07%	0.10%	0.20%
National Mortality Rate	0.001%	0.001%	0.013%	0.000%	0.000%	0.000%	0.000%	0.002%	0.004%

References: Total PCR test is sourced from Covidlive from first case reported till 1st of Sep 2022.[9] This includes the breakdown of PCR test, RAT test and number of deaths. State population is sourced from Australian Bureau of Statistics for each state with the latest available data.[17]

Calculations:

- *Average PCR Tests per Capita is calculated by dividing total PCR tests performed for the state over state population. It represents the average PCR tests per person.
- PCR Test Positivity Rate is calculated by dividing total Positive PCR test for the state over the total PCR tests performed. RAT reporting has been excluded in this calculation due to inaccuracy of reporting, also RAT test only gets reported when it is positive, as a result skewing the positivity rate.
- National Mortality Rate is calculated by dividing the total number of people who passed away diagnosed with COVID-19 over the population.

During the early stages of the pandemic, the Australian pathology sector developed a collaborative approach where the public and private providers worked together on both the federal and state level to combat the disease.

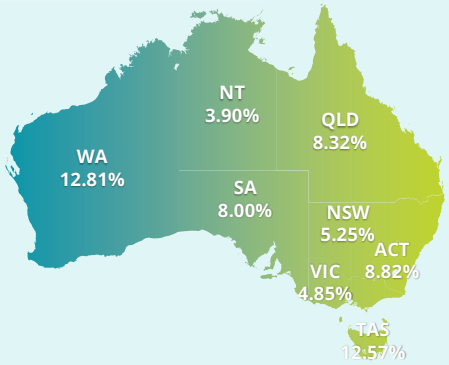
Whilst on the national level the sector was able to rapidly ramp up testing capacity and procure the required equipment to meet the testing demand, each state had unique testing requirements that at times presented challenges to efficient testing and results reporting. NSW and VIC delivered the highest PCR tests per person at 4.27 and 3.38 despite the two states having the largest populations to test and facing additional challenges with the highest numbers of infected international travellers arriving at their ports of entry.

Comprehensive testing and results reporting supported policy makers to identify potential risks of outbreaks and implement or lift lockdowns.

The graph and tables below reports on figures representing testing conducted from the initial COVID-19 reporting to the end of Aug 2022. The date range is selected due to data availability from the time of report creation.

Post vaccination– till end August 2021

State PCR Positivity Rate



National statistics post-vaccine

6.14% National PCR Positivity Rate

0.05% National Mortality Rate

	ACT	NSW	VIC	WA	SA	QLD	NT	TAS	Grand Total
Total PCR Tests	1,303,757	34,594,618	22,149,774	3,272,587	5,550,330	8,424,547	833,149	766,697	76,895,459
PCR Test Positive Cases	114,997	1,817,229	1,097,191	419,270	444,165	700,652	32,486	96,380	4,722,370
RAT Test Positive Cases	89,256	1,649,094	1,546,519	731,324	265,042	901,415	63,463	150,565	5,396,678
Total Positive Cases	204,253	3,466,323	2,643,710	1,150,594	709,207	1,602,067	95,949	246,945	10,119,048
State Population	453,300	8,095,400	6,559,900	2,762,200	1,806,600	5,265,000	249,300	569,800	25,761,500
Total Death	124	4,929	5,342	597	802	1,986	69	180	14,029
Avg PCR Tests Per Person	2.88	4.27	3.38	1.18	3.07	1.60	3.34	1.35	2.98
PCR Test Positivity Rate	8.82%	5.25%	4.95%	12.81%	8.00%	8.32%	3.90%	12.57%	6.14%
National Mortality Rate	0.03%	0.06%	0.08%	0.02%	0.04%	0.04%	0.03%	0.03%	0.05%

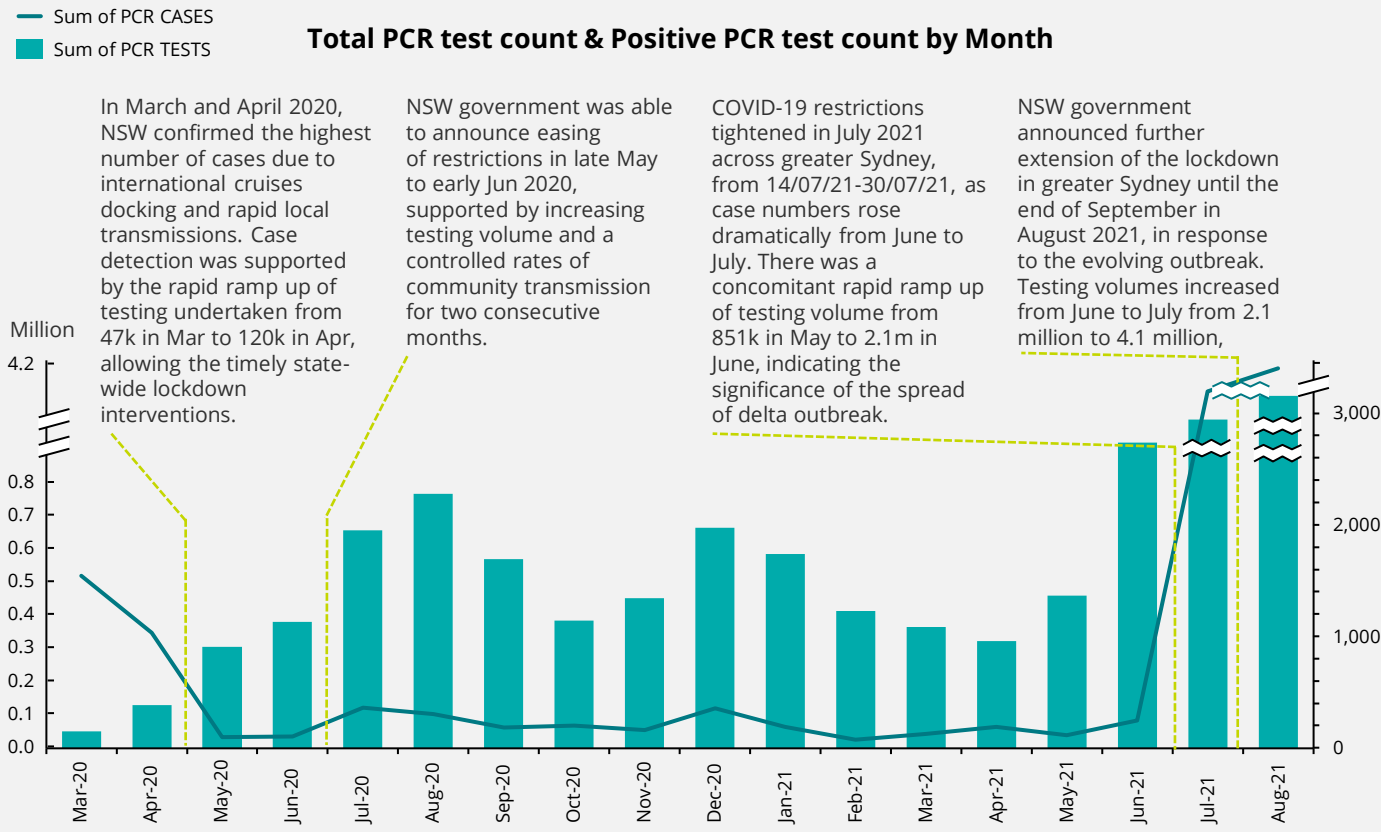
References: Total PCR test is sourced from Covidlive from first case reported till 1st of Sep 2022.[9] This includes the breakdown of PCR test, RAT test and number of deaths. State population is sourced from Australian Bureau of Statistics for each state with the latest available data.[17]

Calculations:

- *Average PCR Tests per Capita is calculated by dividing total PCR tests performed for the state over state population. It represents the average PCR tests per person.
- PCR Test Positivity Rate is calculated by dividing total Positive PCR test for the state over the total PCR tests performed. RAT reporting has been excluded in this calculation due to inaccuracy of reporting, also RAT test only gets reported when it is positive, as a result skewing the positivity rate.
- National Mortality Rate is calculated by dividing the total number of people who passed away diagnosed with COVID-19 over the population.

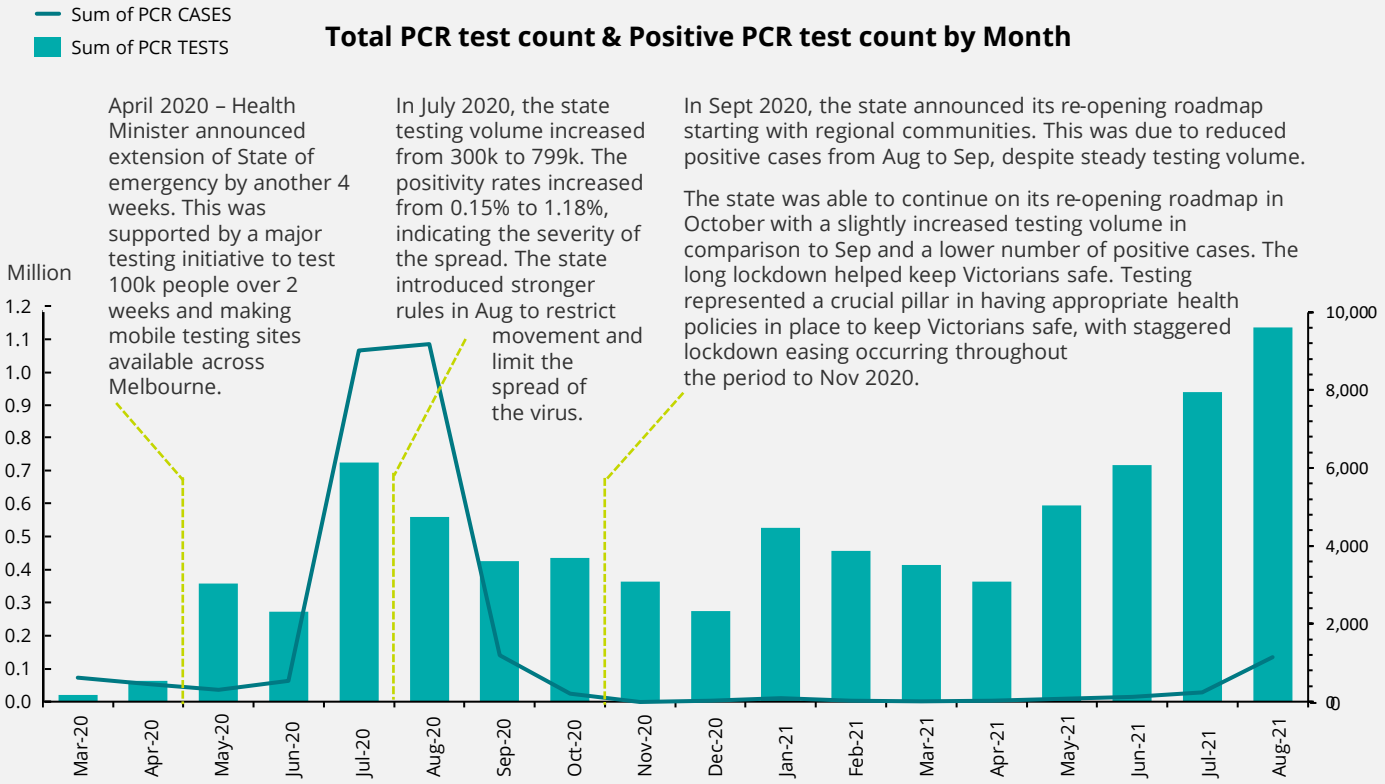
Case study: NSW State pandemic response

Sufficient volumes of PCR testing were crucial to enabling NSW Health to make decisions about lockdown requirements and ensure their timely implementation. NSW had the highest testing per capita rate across all states (4.27 PCR tests per person), and managed to deliver results turnaround times that enabled effective contact tracing and isolation.



Case study: VIC State pandemic response

Victoria had a PCR test rate of 3.38 PCR tests per person. Devolved health service governance and public health infrastructure required significant collaboration between public and private sector pathology providers to deal with community outbreaks and surges in testing requirements.



Comparable International pandemic responses

One of the features of the Australian pandemic response that distinguished it from several other countries was the significant level of cooperation across different levels of government. Under the leadership of a National Cabinet that brought, together heads of Federal and State governments and with ongoing collaboration amongst health departments across the country, Australia coordinated its approach to the pandemic better than many.

The ability of the pathology sector to rapidly scale up testing capacity in response to disease outbreaks, and to deliver reliable data on report outcomes in a timely manner was world-leading in its implementation.

The below table compares the Australian key figures against three other international jurisdictions to provide a background overview of the sector response.

Australia's key COVID-19 figures compared with the UK, US and Canadian jurisdictions (Jan2020 – Aug2022)

	Australia	UK	US	Canada
Total Population	25.8M	68.6M	331.0M	38.5M
Total Tests	76.9M	502.5M	912.8M	62.2M
Total Positive Cases Reported*	10.2M	22.7M	94.4M	4.2M
Total Deaths Reported	14,029	204,613	1.05M	44,472
Case Fatality Ratio	0.14%	0.90%	1.11%	1.06%

Whilst the above table includes information from the beginning of the pandemic until the end of August 2022, more recent data is prone to recording errors and discrepancies in methods of reporting as a result of the introduction of RAT and Lateral Flow Device (LFD) self-reporting internationally.

The table below presents data from the onset of the pandemic till 12 March 2021, one year after the WHO declared COVID-19 a global pandemic. It has been used to exclude data variability arising from self-reporting of RAT/LFD test results.

Australia's key COVID-19 figures compared with the UK, US and Canadian jurisdictions (Jan 2020 – March 2021)

	Australia	UK	US	Canada
Total Population	25.8M	68.6M	331.0M	38.5M
Total Tests	14.8M	96.2M	362.9M	25.7M
Total Positive Cases Reported	29,112	4.2M	29.5M	0.9M
Total Deaths Reported	910	150,850	530,304	22,406
Positivity Rate	0.20%	4.41%	8.12%	3.54%
Case Fatality Ratio	3.13%*	3.55%	1.80%	2.47%
Mortality Rate	0.0035%	0.2199%	0.1602%	0.0582%

Data sourced from Covidlive and Our World in Data from Jan 2020 to 12th of March 2021.
*Total Positive case reported include both self reported and PCR detected.

Case Study: UK

Total Population	68.6M
Total Tests:	502.5M
Total Positive Cases reported:	22.7M
Total Deaths reported:	204,613
Positivity rate:	4.5%
Case Fatality Ratio:	0.90%
Mortality Rate:	0.30%

Data sourced from Our World in Data from Jan 2020 to end of Aug 2022[23]

At the outset of the pandemic, almost all pathology testing in the UK was undertaken in hospital-based NHS laboratories. The lack of a sizable private pathology sector in the UK significantly impacted the initial responses to the pandemic. Rapid testing, effective contact tracing and isolation of infected individuals was not possible due to the lack of appropriate community-based pathology testing infrastructure and the inability of the public pathology system to cope with the volume of tests required.

The NHS Test and Trace Programme, designed to enable community-based approaches to testing for COVID-19, was only established when the national daily cases has risen to 2,000 a day. This made it more difficult to achieve timely contact tracing aided by pathology PCR testing to limit the outbreak.[25]

Testing strategies - policy and the pathology landscape

At the heart of UK's response to COVID-19 pandemic was the NHS Test and Trace Programme. The Programme consists of government-funded services established and set up by the Department of Health and Social Care from Public Health England. The programme mobilised and created a new network of laboratories, walk through and drive through testing sites across the country.[24]

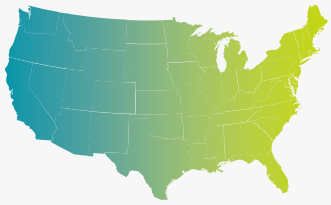
Major challenge - Limited testing capacity and its timely access

In contrast to Australia, at the initial onset of the pandemic, pathology testing in the UK for COVID-19 other than in hospitals was halted due to a lack of testing capacity in the community. This made early community transmission detection more difficult, which led to more rapid spread of COVID-19. Testing capacities were focused on high priorities, which were staff working in the healthcare setting and patients residing in these settings to pragmatically utilise the limited capacity at hand.

The NHS Programme was established on the 28th of May, almost two months after the WHO declared COVID-19 a global pandemic, to ensure sufficient capacity for everyone developing COVID-19 symptoms to be able to be tested in the community. The UK government developed a "Five Pillar" COVID-19 testing strategy which included mass testing for critical workers in the NHS, social care and other sectors as well as antibody testing to determine the broader level of immunity in the community.

The disaggregated nature of the UK pathology sector meant that pathology providers were required to collaborate and work with various suppliers including commercial laboratories (Lighthouse Labs) and logistics services (e.g. Amazon) to build and maintain testing capacity for mass testing, home testing, community testing at NHS trusted locations and care homes. Later Lateral Flow Device (LFD), an antigen test equivalent to a Rapid Antigen Test (RAT) was introduced for faster turnaround times. LFDs were made available nationally in April 2021 once a critical mass in vaccinated population had been reached. The partnership and relationships with commercial partners to provide required laboratory and logistics capacity, and the design, test and deployment of test booking systems within weeks to realise the process efficiencies have proven to be critical to the pathology response in UK.[25]

Case Study: US



Total Population	331.0M
Total Tests*:	912.8M
Total Positive Cases reported:	94.4M
Total Deaths reported:	1.05M
Positivity rate:	10.3%
Case Fatality Ratio:	1.11%
Mortality Rate:	0.32%

Data sourced from Our World in Data from Jan 2020 to end of Aug 2022

The US Healthcare system, like Australia, is a mixed public-private healthcare economy, albeit with a greater reliance on its private health system. Whilst public health services are provided under the Medicare, Medicaid, Children's Health Insurance Program and Veterans' Health programs, the bulk of health services for the general population are provided via employer-based health insurance programs. Approximately two thirds of the US population access healthcare via their private health insurance. The national healthcare coverage was strengthened by the Affordable Care Act (ACA) introduced during the Obama administration, providing millions of its citizens with insurance coverage and access to the healthcare system, mostly benefiting people who were previously uninsured, with lower incomes and socio-economic status, or with pre-existing conditions that prohibits them from accessing affordable healthcare.

Private pathology players play a critical role in the sector - including American Clinical Labs, Quest Diagnostics and Laboratory Corporation of American Holdings.

Testing strategies - policy and pathology landscape

There were significant challenges in the initial approaches to pathology testing due to a lack of a coordinated national approach to provision of authorisation to undertake testing in private laboratories. As a result, community transmission became established with case numbers far exceeding health system capacity to test, trace and isolate individuals.

Eventually, low cost or free community-based testing was made available. The testing response was achieved as a result of sector wide collaboration from both research institutes and commercial partnerships from initiation, mobilisation and the execution of testing. The National Institute of Health (NIH) in April 2020, launched the Rapid Acceleration of Diagnostics Initiative. The initiative was involved in the development of rapid and easy to use testing and sought to expedite nationwide access to testing.[26]

The US ran into PCR capacity issues earlier than Australia due to higher case load during the initial waves, putting extra strain on capacity ramp-ups and turnaround times in the pathology sector to catch the spread. The US quickly become the epicentre of the pandemic in 2020.[27]

Despite a coronavirus aid bill at $25 billion dispersed to states, territories and localities, the goal from the US government to double testing from 1m per week to 2m per week was challenging In a global supply chain requiring testing equipment, lack of a skilled workforce and testing capacity.[27]

An additional lens specific to the US response is the more complex political environment and varied approaches across 50 states, leading to greater uncertainty and inconsistency on testing. Like in Australia, ramping up testing capacity was widely recognised by epidemiologists and health officials as the best way to manage the pandemic and allow society to re-open.[28] By July 2020 however, the US was already experiencing a blowout in test turnaround times, reducing their usefulness as the primary COVID-19 management tool at the time.[29]

By Aug 2020, the US was already shifting the priority towards RAT tests, with a $750m supply agreement signed with Abbott Laboratories. RAT test availability however would not become a reality until months later. FDA approval for RAT tests without a prescription was not granted until December 2020.[30] With the transition to the new Administration in early 2021, increasing testing capacity become the top priority to combat COVID-19 and $50b of additional funding for testing was passed as part of the American Rescue Plan.[31]

Case Study: Canada

Total Population	38.5M
Total Tests*:	62.2M
Total Positive Cases reported:	4.2M
Total Deaths reported:	44,472
Positivity rate:	6.8%
Case Fatality Ratio:	1.06%
Mortality Rate:	0.12%

Data sourced from Our World in Data from Jan 2020 to end of Aug 2022

Canada has a universal and publicly funded healthcare system where all Canadian citizens are able to access healthcare benefits. The country's 13 provinces and territories fund and administer healthcare across the nation, each with its own insurance plan, and receive assistance from the Federal Government.[32]

The pathology sector in Canada is segmented into public/private pathology and hospital-based pathology, with private pathology taking up the largest share of the market due to increase in privatization of clinical laboratories. The main private players within the Canadian market include MedEx Health Services Inc, Medical Imaging Centres Inc and 4c Labs Ltd.[33]

Testing strategies - policy and the pathology landscape

The pathology response in Canada was similar to that of Australia. The pathology sector was able to rapidly ramp up PCR testing capacity and ensured there was sufficient capacity to meet the demand during earlier waves.

This was supported by strong government funding and integration of private providers into the response program. When Omicron hit the country, it resulted in increased demand in testing where the country pivoted its testing strategy towards RATs.

The Public Health Agency of Canada (PHAC) leads Canada's public health response to COVID-19 at a national level. The National Microbiology Laboratory under PHAC collaborates with other public health laboratories across the nation to test specimens sent from provinces and territories as well as the development of accurate COVID-19 tests. In order to provide safety and affective testing programs for the Canadian population, PHAC regulates and authorizes testing devices sold or imported into Canada. Due to this initiative, there have been numerous safe and reliable COVID-19 tests in the country.

Canada experienced relatively low case numbers during the first wave of the pandemic. Whilst the pathology network initially lacked the surge capacity to meet testing demand, government initiatives to centralise resources and integrate private providers into the testing program facilitated an 8 times increase in testing capacity from Mar 202 to Aug 2020.[34] This translated to a sufficient capacity to meet demand during the initial wave, albeit the focus and screening was focused on testing symptomatic people similar to Australia due to capacity constraints.[35]

There was strong government funding support for COVID-19 testing as the key tool to manage the pandemic. To increase testing capacity, $4.3 bn CAD (Canadian Dollars) was allocated as part of the landmark $19B Safe Restart Agreement announced in Sep 2020.[36] In order to manage the outbreak, the federal government partnered with organisations such as Canadian Red Cross to support with the ramp up of testing.

The subsequent more transmissible COVID-19 variants drove a surge in infections, resulting in a PCR testing capacity that's under pressure.[37] This was particularly the case during the Omicron wave in the late 2021 which overwhelmed testing capacity in the most populous provinces of Ontario and Quebec.[38]

As was the case in Australia and other jurisdictions, this forced a pivot towards RATs. There was a rapid ramp-up in Federal government procurement of RATs in early 2022 with $2.5B CAD of dedicated funding allocated in Mar 2022.[39]

05 | The impacts of the Australian pathology sector's response

The pathology sector represents a crucial pillar of the broader healthcare system and played a significant role during the pandemic in detecting cases and outbreaks. PCR testing has played a major role in enabling informed public health decisions. The impacts of the Pathology sector response can be broken into the four main categories. This is described in detail on the following pages.

Reduced community spread of COVID-19

The World Health Organisation identified that It is important to have a measurable metrics in place to measure the adequacy of testing levels. A commonly adopted and benchmarked metric over the past two years to measure the adequacy of testing level is positivity rate.

Positivity rate is the proportion of reported tests that return a positive result. When testing at a population level, low positive rates indicate that there is a low number of undetected cases in the community. In contrast, high COVID-19 positivity rates indicated large outbreaks or numbers of cases in the community, or potentially inadequate levels of testing. The threshold recommended by the World Health Organisation (WHO) for a positivity rate considered high is 5%.

In March 2021, 12 months after the WHO declared COVID-19 a pandemic, Australia, Canada, and United Kingdom had average positivity rates all below the 5% threshold, with Australia having 0.3% of the tests being positive, whilst other countries such as the US with a positivity rate significantly higher than the threshold. As evidenced by each of the 4 countries' relative positive case per 1,000 population for the same time period, adequacy and availability in pathology testing levels has clearly demonstrated its positive impact and value in containing and controlling outbreaks, and in informing interventions leading to reduced positive cases in the community.

Rate of Transmission: Early in the pandemic it became clear that the rate of transmission of COVID-19 from an infected individual to others they came in contact with was a critical measure of the effectiveness of public health controls. This is measured by R or R0 (reproduction rate), and is the average number of people one person with the disease will likely infect.[1] Accurate PCR testing provided by the pathology sector formed the basis of the calculation of the R rate in community outbreaks in Australia and around the world. This was the foundation upon which all major public health strategies were based in the early phases of the pandemic.

Improved health outcomes

Numerous studies have demonstrated the importance of early diagnosis in allowing rapid isolation, reduction in transmission and improved outcomes from treatment in high-risk individuals. PCR testing remains the gold standard for the early diagnosis of COVID-19 and is a critical component of treatment algorithms guiding early access to anti-viral medication, oxygen therapy and intensive care management.

Antiviral treatment: For those patients eligible for anti-viral treatment for COVID-19, it is critically important that accurate diagnosis occurs as early as possible in the course of their infection. Current data suggests that commencement of anti-virals within 2 days of infection results in the best outcomes.[1] The importance of having an agile, rapidly responsive pathology testing program has been demonstrated to support optimal utilisation of antiviral medications.

Hospitalisation: Studies demonstrate that early testing and symptom management is instrumental in avoiding unnecessary hospitalisation in infected individuals, especially in high-risk patients to reduce risk of severe illness.[2]

Intensive Care treatment: Confirmation of COVID-19 positivity via PCR is critical in highly symptomatic high-risk individuals who may be likely to require intensive care admission and management of their COVID-19 infection.[2]

Mortality – Australia has maintained one of the lowest mortality rates in the world throughout the pandemic. the widespread availability of pathology testing to allow containment of outbreaks, as well as a health care system that was protected from the catastrophic rates of infection amongst healthcare workers in other countries saved the lives of tens of thousands of Australians.

Supported communities and the economy

GDP: The widespread lockdowns implemented to control the pandemic in Q2 and Q3 of 2020 resulted in the greatest global economic shock since the Great Depression, with nearly all major economies falling into recession, including Australia.

The extent of the lockdowns were directly driven by the level of community transmission and adequate testing capacity. Australia's low positivity rate allowed most state jurisdictions to relax restrictions relatively early, which facilitated a quick rebound in economic activity.

States were able to implement targeted measures such as border restrictions and "snap" lockdowns based on data made available through PCR testing.

This helped drive the outperformance of the overall Australian economy.

Unemployment: Without adequate testing capacity provided by the pathology sector, the initial lockdowns and state specific restrictions would likely have been significantly longer. It is unclear that indefinite government subsidises would have been possible under such a scenario and it is probable many more businesses would not have survived the initial COVID-19 waves. Any subsequent recovery in the labour market would consequently have been much weaker. By June 2021 the total number of employed people in Australia had exceeded pre-COVID-19 levels.

Household spending: Australia's ability to contain the virus through strong testing and adherence to the public health measures allowed easing of restrictions faster than many other countries. This saw consumer mobility rebound strongly and a quick recover to household spending.

Consumer Confidence: The confidence of Australian consumers was observed to rebound much faster than in the USA, UK and Canada. This reflects the effective containment of early waves of the virus and the faster easing of public health measures that could not have been achieved without the testing capacity provided by the pathology sector.

Protected hospitals and public health system

To review the impact of pathology testing adequacy and its positive implications on the overall healthcare system, data comparing the Australian national positivity rates have been used to illustrate its impact on the healthcare system from both capacity and urgency perspectives.

Hospitalisation and ICU care: Accurate and timely diagnosis from pathology testing helped to minimise the severity of the disease from progressing to the state requiring hospital care. This was critical to prevent the healthcare system from being overwhelmed and to allow adequate levels of capacity (i.e. available to respond to emergency care needs from the community.

There is a positive correlation between positivity rates against number of patients hospitalised and patients treated in ICU. Where there is

a low positivity rates, indicating adequate level of tests performed, the number of hospitalised patients and of those that requires ICU care was reduced.

Healthcare Workforce: The early availability and rapid deployment of pathology testing was a key component in protecting the Australian Healthcare workforce from the impacts of the pandemic experienced in many other countries. Through maintenance of high rates of community testing, and low rates of community transmission of COVID-19, Australian hospitals and their workforce were not infected en-masse as they were elsewhere, and we did not see high numbers of deaths and morbidity amongst health workers.

Aged Care: Early in the pandemic, Residential Aged Care Facilities were identified as a highly vulnerable part of the community. After tragic outbreaks in these facilities, pathology testing became a mainstay of the protection of these facilities until a vaccine could be developed.

Pathology testing and its correlation with reduced positive cases

Pathology testing and its correlation with reduced positive cases

In the early stages of the pandemic prior to the availability of therapies such as antiviral treatment and vaccinations, the containment strategy to reduce transmission and prevent widespread outbreaks was based on three basic public health strategies:

- The first was on health detection which relied heavily on the PCR testing to identify outbreaks
- The second was contact tracing which relied on the timeliness of PCR testing and reporting
- The third being isolation, which required a PCR testing post the isolation period to confirm that individuals were safe to come out of isolation and back to the community

The effectiveness of the three interventions in the Australian context in the early phase of the pandemic translated to lower hospital admissions and a lower mortality rate in comparison to other comparable jurisdictions. Pathology testing proved to be key to public health interventions that collectively produced the positive outcomes for all Australians.

Timely and accurate diagnosis became more crucial when antiviral treatments became available, due to their high cost and initial low availability.

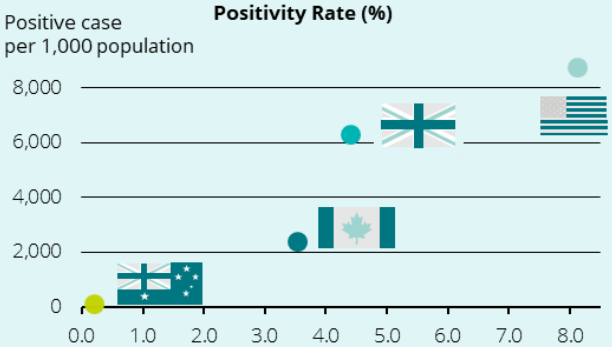
Timely diagnosis, supported by rapid access to testing, is critical to ensuring those with highest clinical needs that would benefit from antiviral treatments are able to access them as soon as practical. This includes but is not limited to patients living in residential aged care facilities, rural and remote communities, Aboriginal and Torres Strait Islander people, and patients with a disability in supported living settings.[43]

Positivity Rate

When testing at a population level, low positive rates can indicate that there is a low number of undetected cases in the community and/or that there is a high level of overall testing. In contrast, high COVID-19 positivity rates indicate large outbreaks or numbers of cases in the community, or potentially inadequate levels of testing.

The threshold recommended by the World Health Organisation (WHO) for a positivity rate considered high is 5%.[41]

Throughout most of the pandemic, Australia had some of the lowest positivity rates globally, afforded by both high rates of testing and low case rates as a result of periods of highly stringent public health orders and restrictions on movement.



As of 12th of March 2021, 12 months after the WHO declared COVID-19 a pandemic, Australia, Canada, and United Kingdom had average positivity rates all below the 5% threshold, with Australia having a 0.2% positivity rate. In contrast, other countries such as the US with a positivity rate significantly higher than the threshold.

X-Axis: The positivity rate is calculated based on the total number of positive cases reported over the total number of tests conducted. This is a proxy for the adequacy of COVID-19 testing, where higher positivity rate means less adequate testing levels

Y-Axis: Positive cases per 1,000 population is a proxy for the level of community transmission and consequently overall COVID-19 burden on health system.

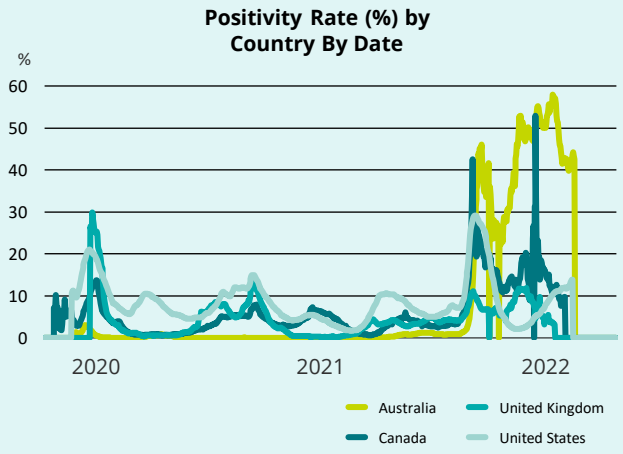
NB: To prevent RAT (Rapid Antigen Test) & LFD (Lateral Flow Device - UK) test volume from skewing the data set, the date range from onset of COVID-19 to 1 year after the WHO declared it a pandemic (12th of March 2021) have been used across the data points to ensure consistency and comparability.

Improved health outcomes

The positive impact the pathology sector had on the healthcare system was achieved through reduction in severity of disease progression, reduction in hospitalisation and reduction in ICU admissions compared to the other jurisdictions where widespread pathology testing was not available to underpin the public health response in the early stages of the pandemic. There can be little doubt that the agility and responsiveness of the Australian private pathology sector significantly reduced the burden on the healthcare system and enabled it to cope with the logistical and workforce pressures presented by the pandemic.

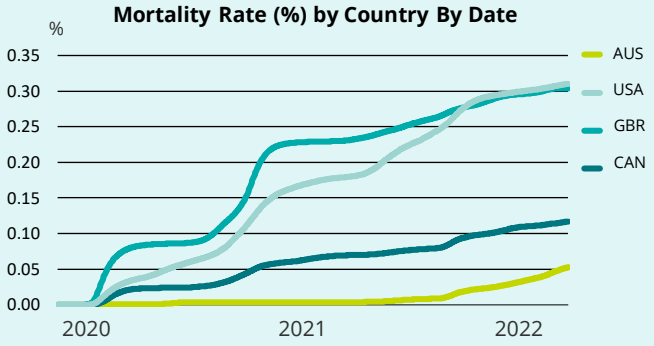
To review the impact of pathology testing and its positive implications on the overall healthcare system, data comparing Australia health outcomes with three other comparable international jurisdictions have been used to depict and highlight the relative performance on:

1. Positivity Rate: National positivity rates have been used to illustrate the adequacy of testing.

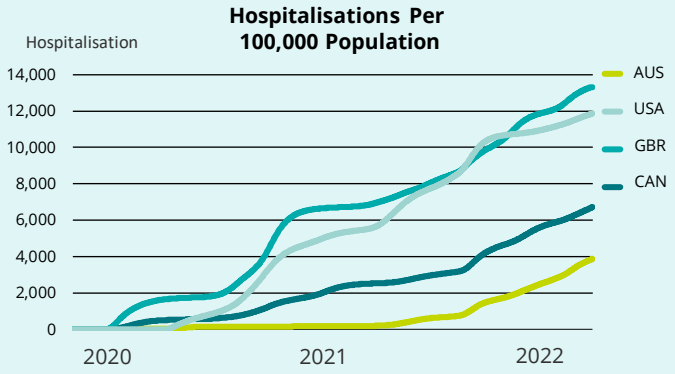


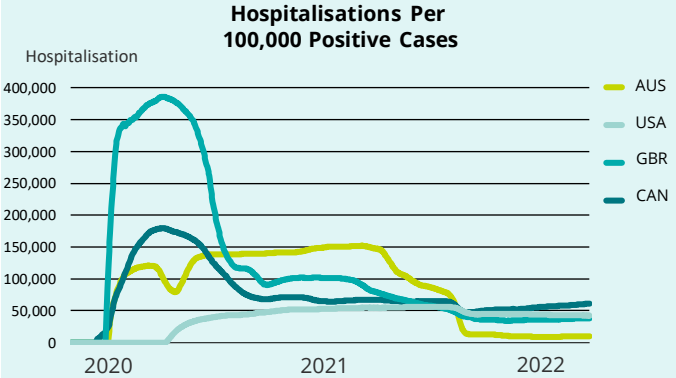
Pathology testing and its correlation with reduced positive cases

2. Mortality Rate: Total number of patients passed away over population.

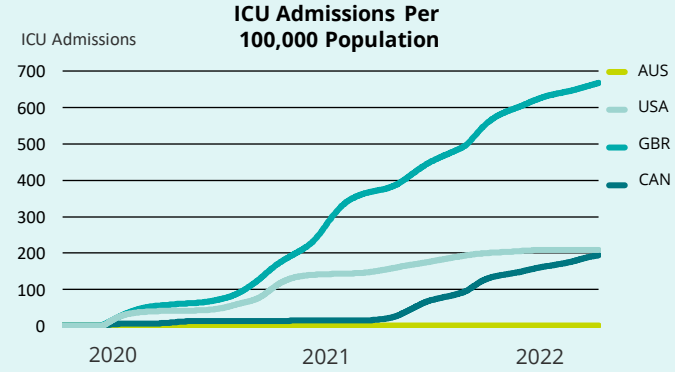


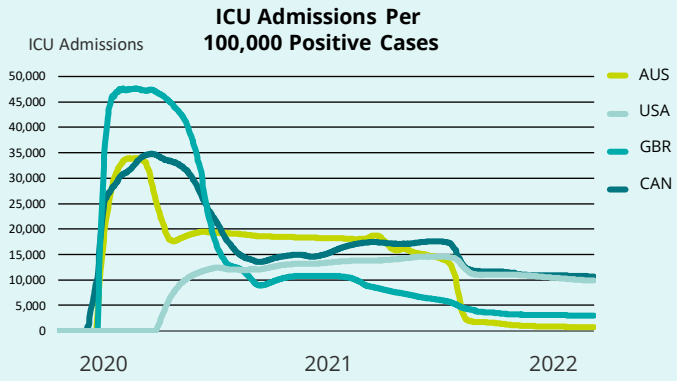
3. Hospitalisations: Number of people with COVID-19 who are hospitalised for the treatment of their diseases provides a good indication on the extent of severity of their disease states.





4. ICU Admissions: The number of patients hospitalised requiring ICU care represented the most critical cases.





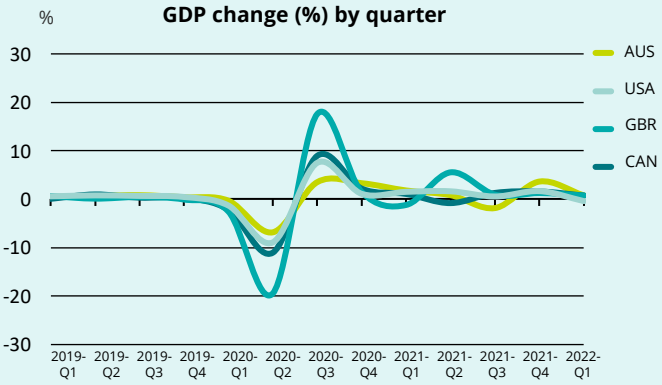
All were dramatically lower in Australia than comparable countries as a result of a “test, trace and isolate" public health strategy that depended on the high levels of PCR testing made available by the Australian private pathology sector.

GDP contractions

The pandemic has led to major economic impact on countries around the world. The graph below depicts the percentage change in economic output by quarter for Australia, Canada, United Kingdom and United States from the 1st quarter of 2019 to the first quarter of 2022.[45]

The widespread lockdowns implemented to control the pandemic in Q2 and Q3 of 2020 resulted in the greatest global economic shock since the Great Depression, with nearly all major economies falling into recession, including Australia.

The extent of the lockdowns were directly driven by the level of community transmission. Australia’s low positivity rate allowed most state jurisdictions to relax restrictions relatively early, which facilitated a quick rebound in economic activity. States were able to implement targeted measures such as border restrictions and “snap” lockdowns. This was supported by strong testing levels and allowed minimal disruption to economic activity in states such as WA and QLD. This helped drive the outperformance of the overall Australian economy.



Pathology testing and its correlation with reduced positive cases

	AUS	UK	US	CAN
Peak GDP contraction (quarterly)	-7.0%	-19.4%	-8.9%	-11.0%
GDP change (Q2 2020 – Q2 2022)	4.8%	3.3%	4.1%	3.1%
Peak unemployment rate	7.5%	5.4%	14.7%	13.4%
Lowest consumer confidence index value	98.3	97.4	98.6	96.7
HFCE change (Q4 2019 – Q1 2021)	-1.5%	-12.8%	-0.2%	n/a

Workforce and employment

Globally, unemployment rates increased significantly during the initial COVID-19 waves due to lockdown policies and subsequent contractions in economic activity.

During the peak of the national lockdowns in July 2020, over 1,000,000 Australians had lost their jobs. The unemployment rate was around 7.5 per cent, up from just over 5 per cent prior to the pandemic. Sectors such as tourism, hospitality and retail were particularly hard hit.

As lockdowns were eased across the different state jurisdictions due to low positivity rates on PCR testing, employment levels slowly rebounded. Aided by the support of significant government subsidies, many employers were able to stay in business during the relatively short lockdown periods across most states, and were ready to re-hire employees once restrictions eased and trading returned.

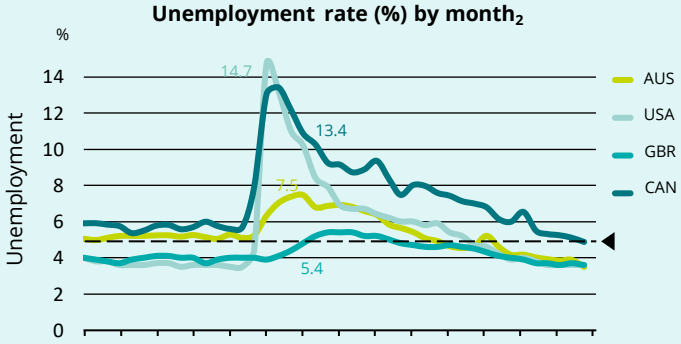
By June 2021 the total number of employed people in Australia had exceeded pre-COVID-19 levels. The strong economic rebound, and prolonged international border closures, led to a dramatic tightening of the labour market, with a record number of job ads and labour shortages reported across a number of industries. The unemployment rate dropped to near record lows.[46]

The pathology sector mobilised and employed a significant amount of people in the community during the pandemic. This included significant number of employees in the logistical and processes operations side to mobilise testing capacity rapidly. A significant portion of the workforce are residents in the local communities from diverse industries who were laid off during the initial waves.

Without adequate testing capacity provided by the pathology sector, the extent of community transmission would have been higher and the initial lockdowns and state-specific restrictions may have been significantly longer. Prolonged government subsidies may not have been possible under a such a scenario and it is probable many more businesses would not have survived the initial COVID-19 waves. Any subsequent recovery in the labour market would likely have been much weaker as a consequence.

This can be seen when comparing Australia's experience to that of other countries – particularly the USA and Canada – through the data shown in the chart. Faster community transmission and lower testing surveillance resulted in deeper economic downturns, with the US and Canadian unemployment rates peaking at nearly 15 per cent and over 13 per cent, respectively. Labour markets in these countries took much longer to rebound to pre-pandemic levels than in Australia – the US and Canada took 25 and 24 months, respectively, compared with Australia's 15 months.

Unemployment rate (%) by month[2]



[2]Source: Australian Bureau of Statistics, Labour Force, Australia for previous 5 year period from July 2017 to June 2022[47]; Office for National Statistics, Labour Force Statistics [48]; U.S. Bureau of Labor Statistics, Labor Force Statistics from the Current Population Survey[49]; Statistics Canada, Labour force characteristics by province, monthly, seasonally adjusted.[50]

06 | Future of pathology in a post-pandemic health system

The pandemic has clearly demonstrated the value of a large scale responsive private pathology sector in Australia. In a post-pandemic world, with the ongoing challenges facing modern healthcare, the pathology sector will be vital in supporting improved diagnostics, life-long personalised wellness management, genomic based therapies and public health protection.

Next variant could emerge at any point

Given the genome mutations of Alpha, Beta, Gamma, Delta, and most recently the Omicron variant and subvariants that have rapidly swept the globe, leading scientists, evolutionary biologists and researchers around the globe are all wondering what will come next.

Recent studies indicate the SARS-CoV-2 virus has the ability to infect immunocompromised individuals for longer periods of time, and this gives the virus a greater chance to mutate and re-emerge in new varied states. Researchers have hypothesized that chronic infections could drive the “unpredictable emergence” of new variants.[52]

Dr. Maria Van Kerkhove, infectious disease epidemiologist and technical lead at the World Health Organisation, warns against complacency at this stage of the pandemic, noting that "even without a new variant immediate upon us, the communities around the globe will likely continue facing waves of diseases as immunity reduces and new sub-variants arise".[53] The appropriate level of testing equipment capacity, materials, and workforce needs to be in place to ensure the pathology services sector is well equipped to provide adequate response when the next variant arrives.

Given the unpredictability of when and how infectious a variant will emerge, a good surveillance system in place aided by pathology testing and contact tracing is critical to monitor the spread of existing and evolving sub-variants to protect the communities.

An efficient and effective pathology sector is critical to preparedness

The pandemic has accelerated change across the globe and highlighted the importance of an adaptive and resilient healthcare system. It is critical that Australia set up and maintain the right health infrastructure to strengthen the nation’s pandemic preparedness.

An efficient and well-equipped private pathology sector allows early disease detection and prevention, and will continue to shift the reactive and practitioner driven models of care to one that is balanced with early disease diagnosis and intervention driven by a more proactive and informed patient group. Australia demonstrated a world-leading ability to manage the COVID-19 pandemic in containing outbreaks, early detection and contact tracing, and building the right level of infrastructure as part of the broader healthcare ecosystem.[54] It should not, however, lose sight of the need to maintain a viable private pathology capability to continue to drive innovation and to provide much needed surge capacity during crises. The need to maintain diagnostics capability for case identification as well as

genomic sequencing and analysis to track pathogen variants in the community have been highlighted as key areas of focus to improve preparedness for the next pandemic according to Commonwealth Scientific and Industrial Research Organisation's (CSIRO) publications on future pandemic preparedness.[54]

It is critical to maintain and ensure adequacy in testing capacity in the pathology sector to continue meeting this urgent need including both an adequate network of collection centres, testing laboratories and a skilled workforce.

Macro-economic pressures and high inflation rates will raise the pathology sector cost significantly as collection centre rents, consumable costs, equipment and labour cost all translate to increased operating pressure for the sector to maintain coverage and network.

The Australian public and economy will benefit from an effective primary and preventative healthcare sector to ensure equitable access and the healthcare system's financial sustainability. COVID-19 has demonstrated how disruptive and costly infectious disease can be on individual and community health and economic development for our society

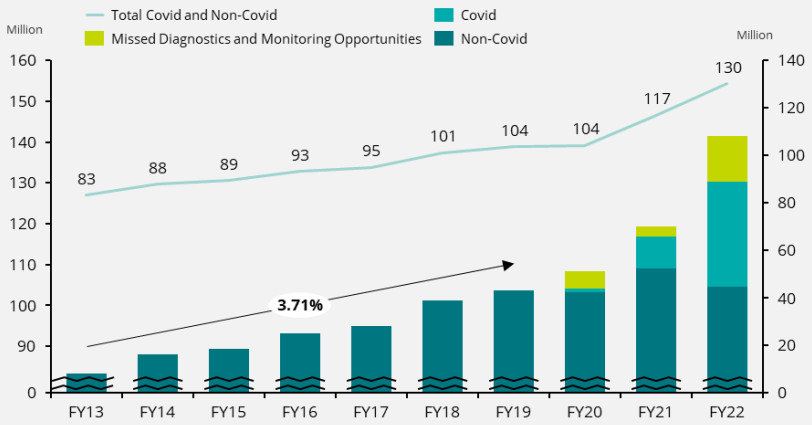
It is critical that the right investment is in place to build a harmonised healthcare ecosystem supported by a strong pathology sector to find the balance between treating sickness in reactive healthcare settings and promoting early disease detection and improving long term wellness.

Risks arising from tests not performed during the pandemic

Pathology services provide clinicians with vital information in early diagnosis and management of various diseases. The graph below depicts the MBS services counts over the previous 10 years inclusive of both COVID-19 and non-COVID-19 testings, to highlight the trends in the pathology sector.

To estimate the industry demand over the next 3-4 years, we have reviewed and assessed the Medicare Benefits Scheme (MBS) data during the previous 10 years to pinpoint and highlight the impact of COVID-19 testing in the industry.

MBS Services Count and Growth Rate



The graph above sources data from MBS from the year July 2013 to June 2022.

Non-COVID-19 testing:

- MBS data for non-PCR testing across FY13 to FY19 shows a compound annual growth rate (CAGR) of 3.71%.
- Using this growth rate, there is an estimated total of 17.9 million services in missed diagnostics and monitoring opportunities during the pandemic from 2020 to 2022, based on MBS data alone. The graph on the left demonstrates that there was a significant drop in non COVID-19 testing services in FY20 to FY22. This includes the national screening programs aimed at preventative healthcare including cancer screening.
- Similar patterns of testing have been seen in other countries as a result of the pandemic.

- It is expected that there will be a consequential rise in preventable cancers and chronic disease associated with missed screening or early detection testing for these diseases during the pandemic.[51]

Demand for healthcare is likely to continue to grow

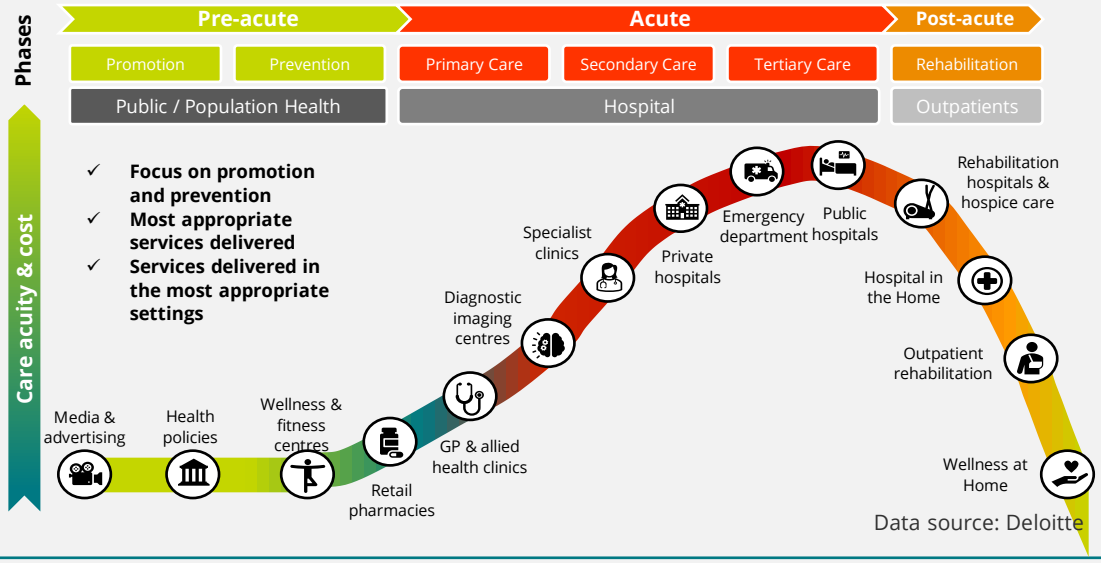
The Pathology sector plays a critical role in primary care within the care continuum, with preventative measures being critical to reduce the end-to-end healthcare cost and constraints.

Australia, like all other developed world health systems, is facing a number of significant challenges as it seeks to continue to provide high quality healthcare to its ageing baby boomers in a way that is financially sustainable.

Exacerbated by COVID-19 pandemic, the health workforce has experienced fatigue, burnout and mental healthcare issues driven by the greater workload and social isolation over the past two to three years. The ageing population will result in declining workforce participation rates and increasing healthcare demand due to increased incidences of chronic illnesses. Deloitte modelling estimates that our healthcare workforce must become four times more productive by 2050 to meet forecasted demand.

There is a need to re-imagine the health delivery models of care, reduce the administrative burden on healthcare workers, and increase focus on early detection and prevention of health problems to reduce the system wide workforce constraints.

With a reactive healthcare system that is currently heavily geared towards acute treatment of illnesses, the cost of healthcare is rising at an unsustainable rate.



Healthcare is becoming increasingly personalised

The healthcare system in Australia faces challenges to serve all Australians equally. This is an important issue especially affecting the most vulnerated and impacted communities and resulting in poorer health outcomes in indigenous Australians, residents of rural and remote communities, and people of low socio-economic status.

The advent of new diagnostic and therapeutic modalities that allow personalisation of treatment options, combined with rising consumer expectations within a community that has had to become expert in managing their own health risks during the pandemic, will put pressure on funders and providers to deliver care in ways that are acceptable to empowered healthcare consumers.

Consumers, who have started to expect the same sort of access and service from healthcare providers that they receive in other parts of the consumer market, will increasingly demand access to early diagnosis and treatment in non-hospital based settings. Proactive maintenance of wellness will increasingly be utilised by health systems to try to manage costs and deliver improved satisfaction and outcomes amongst these increasingly well-informed consumers.

In order to deal with all these challenges, it will be increasingly important to employ tools that allow earlier diagnosis and treatment of disease conditions, but also to move the focus of healthcare out of hospitals and into more cost-effective community settings that deliver management of lifetime health risks and wellness.

The existence of a strong, agile and responsive pathology sector is essential to meet these challenges. Short term approaches to saving costs on pathology expenditure may result in longer term pressure on health budgets if the potential real savings that pathology can deliver to healthcare expenditure are not supported.

The importance of pathology as one of the key foundations in the diagnostic and therapeutic paradigm of twenty first century medicine will only increase over coming decades. The demand for earlier detection and prevention of illness and approaches to lifelong management of identified genetic risk factors for disease based on personalised genome sequencing and analysis of metabolomics and microbiomics will require a responsive, agile, technology enabled, and constantly available pathology sector in Australia.

Demand for pathology services will continue to be driven in the near term by an aging population, increasing healthcare awareness, and an accumulated missed diagnostics and monitoring opportunities of non-PCR tests from postponed GP health check visits and elective surgery by the public over the past two to three years.

Technology innovation in the sector has increased both the testing capacity by introducing scalable and automated testing processes, and the range of tests on offer to the public including whole genome sequencing, cognitive health testing and artificial Intelligence aided histopathology.

Growing health consciousness means that patients are more proactive in seeking health solutions and positive outcomes. Pathology testing will be sought by consumers and providers to guide lifelong management of identified health risks, maintenance of wellness, and personalised approaches to therapies to optimise outcomes and reduce complications of treatment.

The future of health will inevitably confirm that pathology testing is a critical part of the care continuum and will provide a long-term benefit to the end-to-end healthcare spectrum over decades, through reducing acute and emergency type care needs down the track.

07 | References

Executive Summary
3. As Omicron rages on, scientists have no idea what comes next (https://www.science.org/content/article/omicron-rages-scientists-have-no-idea-what-comes-next)

01 | Context
4. RACGP fact sheets "(Pathologists are indispensable to our medical system, but who are they, and why are they so crucial?")
8. Medicare Item Reports (http://medicarestatistics.humanservices.gov.au/statistics/mbs_item.jsp)

02 | Overview of Australia's Pandemic Response
5. Use of emerging testing technologies and approaches for SARS-CoV-2: review of literature and global experience in an Australian context
6. BHI quarterly – Bureau of Health Information quarterly (https://www.bhi.nsw.gov.au/)
9. Covid Live (https://covidlive.com.au/)
10. The R Number (https://www.newscientist.com/definition/r-number/)
11. R0 and Re of COVID-19: Can We Predict When the Pandemic Outbreak will be Contained? (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7751056/)
12. Covid19 Data in Australia (covid19data.com.au)
13. Estimating the case detection rate and temporal variation in transmission of COVID-19 in Australia (https://www.doherty.edu.au/uploads/content_doc/Estimating_changes_in_the_transmission_of_COVID-19_April14-public-release.pdf)
14. Modelling the current impact of COVID-19 in Australia (https://www.health.gov.au/sites/default/files/documents/2020/04/modelling-the-current-impact-of-covid-19-in-australia.pdf)

03 | How did the pathology sector help to achieve this?
7. The first year of COVID-19 in Australia: direct and indirect health effects - AIHW (https://www.aihw.gov.au/reports/burden-of-disease/the-first-year-of-covid-19-in-australia/summary)
15. Study: Incubation times of SARS-CoV-2 variants fell over time (https://www.cidrap.umn.edu/news-perspective/2022/08/study-incubation-times-sars-cov-2-variants-fell-over-time)
16. First real-world studies on COVID-19 oral antivirals emerge (https://www1.racgp.org.au/newsgp/clinical/first-real-world-studies-on-covid-19-oral-antivira#:~:text='Early%20initiation%20of%20oral%20antivirals,controls%2C'%20the%20study%20states.)

04 | Australian Jurisdictional and international response
17. National, state and territory population – Australia Bureau of statistics (https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/latest-release)
18. Covid-19: UK government plans to spend £100bn on expanding covid-19 testing to 10 million a day (https://www.bmj.com/company/newsroom/covid-19-uk-government-plans-to-spend-100bn-on-expanding-covid-19-testing-to-10-million-a-day/)
19. COVID-19 Response: Living with COVID-19 (https://www.gov.uk/government/publications/covid-19-response-living-with-covid-19/covid-19-response-living-with-covid-19)
20. Biden Administration to Invest More Than $12 Billion to Expand COVID-19 Testing (https://www.hhs.gov/about/news/2021/03/17/biden-administration-invest-more-than-12-billion-expand-covid-19-testing.html)
21. Safe Restart Agreement (https://www.canada.ca/en/intergovernmental-affairs/services/safe-restart-agreement.html)
23. United Kingdom Pandemic Profile (https://ourworldindata.org/coronavirus/country/united-kingdom)
24. NHS England pathology network (https://www.england.nhs.uk/pathology-networks/)
25. Coronavirus: lessons learned to date report published (http://committees.parliament.uk Coronavirus: lessons learned to date published on the 12th of Oct 2021)
26. Why COVID-19 testing is the key to getting back to normal (https://www.nia.nih.gov/news/why-covid-19-testing-key-getting-back-normal)
27. Inside America's unending testing snafu (https://www.politico.com/news/2020/04/22/coronavirus-testing-problem-america-201372)

28. Number of COVID-19 tests required by the US to reopen (https://www.newyorker.com/news/news-desk/how-much-coronavirus-testing-does-the-united-states-need-toreopen)
29. Surge in U.S. coronavirus cases causes testing delays across the nation as labs scramble to keep up (https://www.cnbc.com/2020/07/13/us-coronavirus-surge-leads-to-testing-delays-across-the-nation-quest-diagnostics-says.html)
30. Trump to announce $750 million deal with Abbott for at least 150 million rapid coronavirus tests (https://www.cnbc.com/2020/08/27/trump-to-announce-750-million-deal-with-abbott-for-at-least-150-million-rapid-coronavirus-tests.htm)
31. The Whitehouse COVID-19 priorities (https://www.whitehouse.gov/priorities/covid-19/)
32. Canada Health system (https://www.commonwealthfund.org/international-health-policy-center/countries/Canada)
33. Medical and diagnostic laboratories in Canada (https://www.dnb.com/business-directory/company-information.medical_and_diagnostic_laboratories.ca.html?page=3)
34. Testing surge capacity—A Canadian COVID-19 experience, Ontario's surge capacity for the first wave (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8354859/)
35. Review of Canada's Initial Response to the COVID-19 Pandemic (https://www.cpha.ca/review-canadas-initial-response-covid-19-pandemic)
36. Testing for COVID-19: Increasing testing supply (https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/symptoms/testing/increased-supply.html)
37. Canada will miss COVID-19 cases as testing systems become overwhelmed: experts (https://globalnews.ca/news/8466314/covid-pcr-test-shortage-canada/)
38. Provinces working to meet demand for COVID-19 testing as cases surge (https://www.theglobeandmail.com/canada/article-provinces-working-to-meet-demand-for-covid-19-testing-as-cases-surge/)
39. Canada plays catchup on rapid testing amid Omicron surge (https://www.theguardian.com/world/2022/jan/05/canada-rapid-testing-free-omicron-surge)

05 | The impacts of the Australian pathology sector's response
1. First real-world studies on COVID-19 oral antivirals emerge (https://www1.racgp.org.au/newsgp/clinical/first-real-world-studies-on-covid-19-oral- antivira#:~:text='Early%20initiation%20of%20oral%20antivirals,controls%2C'%20the%20study%20states.)
2. Results of an early second PCR test performed on SARS-CoV-2 positive patients may support risk assessment for severe COVID-19 (https://www.nature.com/articles/s41598-021-99671-5)
41. COVID-19 Testing: Understanding the "Percent Positive" (https://publichealth.jhu.edu/2020/covid-19-testing-understanding-the-percent positive#:~:text=The%20percent%20positive%20will%20be,haven't%20been%20tested%20yet.)
43. Antiviral treatments for COVID-19 (https://www.nps.org.au/coronavirus/antiviral-treatments-for-covid-19)
45. Listings of WHO's response to COVID-19 (https://www.who.int/news/item/29-06-2020-covidtimeline)
46. OECD data quarterly GDP (https://data.oecd.org/gdp/quarterly-gdp.htm#indicator-chart)
47. Australia Bureau of statistics – labour force (https://www.abs.gov.au/statistics/labour/employment-and-unemployment/labour-force-australia-detailed/latest-release)
48. Office for national statistics UK (https://www.ons.gov.uk/)
49. US Bureau of Labour statistics (https://www.bls.gov/)
50. Labour force characteristics by province, monthly, seasonally adjusted (https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410028703)

06 | Future of pathology in a post-pandemic health system
51. COVID-19 Recovery: Implications for cancer care (https://www.canceraustralia.gov.au/covid-19/covid-19-recovery-implications-cancer-care)
52. BHI quarterly – Bureau of Health Information quarterly
53. As Omicron rages on, scientists have no idea what comes next (https://www.science.org/content/article/omicron-rages-scientists-have-no-idea-what-comes-next)
54. CSIRO charts our preparedness for the next pandemic – (https://www.csiro.au/en/news/News-releases/2022/Pandemic-preparedness)

This communication contains general information only, and none of Deloitte Touche Tohmatsu Limited ("DTTL"), its global network of member firms or their related entities (collectively, the "Deloitte organisation") is, by means of this communication, rendering professional advice or services. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser. Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited ("DTTL"), its global network of member firms, and their related entities (collectively, the "Deloitte organisation"). DTTL (also referred to as "Deloitte Global") and each of its member firms and related entities are legally separate and independent entities, which cannot obligate or bind each other in respect of third parties. DTTL and each DTTL member firm and related entity is liable only for its own acts and omissions, and not those of each other. DTTL does not provide services to clients. Please see www.deloitte.com/about to learn more.

About Deloitte

Deloitte is a leading global provider of audit and assurance, consulting, financial advisory, risk advisory, tax and related services. Our global network of member firms and related entities in more than 150 countries and territories (collectively, the "Deloitte organisation") serves four out of five Fortune Global 500® companies. Learn how Deloitte's approximately 312,000 people make an impact that matters at www.deloitte.com.

About Deloitte Asia Pacific

Deloitte Asia Pacific Limited is a company limited by guarantee and a member firm of DTTL. Members of Deloitte Asia Pacific Limited and their related entities, each of which are separate and independent legal entities, provide services from more than 100 cities across the region, including Auckland, Bangkok, Beijing, Hanoi, Hong Kong, Jakarta, Kuala Lumpur, Manila, Melbourne, Osaka, Seoul, Shanghai, Singapore, Sydney, Taipei and Tokyo.

About Deloitte Australia

The Australian partnership of Deloitte Touche Tohmatsu is a member of Deloitte Asia Pacific Limited and the Deloitte organisation. As one of Australia's leading professional services firms, Deloitte Touche Tohmatsu and its affiliates provide audit, tax, consulting, risk advisory, and financial advisory services through approximately 8,000 people across the country. Focused on the creation of value and growth, and known as an employer of choice for innovative human resources programs, we are dedicated to helping our clients and our people excel. For more information, please visit our web site at https://www2.deloitte.com/au/en.html.Liability limited by a scheme approved under Professional Standards Legislation.

Member of Deloitte Asia Pacific Limited and the Deloitte organisation.

AUSTRALIAN
Pathology

Level 1, 16 Napier Close
Deakin, ACT 2600

02 6282 2277
02 6122 8548

info@australianpathology.com
Australianpathology.com

Representing private pathology in Australia