Australian Government

(COVID-19)

IMPACT OF COVID-19

Theoretical modelling of how the health system can respond

Australia has a world class health system, including a National Plan for Pandemics. This plan includes modelling possible scenarios of COVID-19 spreading through the Australian population, which is informing the actions Australian government and medical experts are taking to slow the spread and prepare our health system.

This document outlines scenario modelling undertaken to inform how Australia is preparing our health system, including our intensive care units, for COVID-19. **The modelling does not reflect the actual spread of the virus in Australia or the decisions the National Cabinet has taken to slow the spread**. The National Cabinet has now asked the modellers to refine future modelling to reflect the actual experience in Australia, including the impact of the measures we have in place.

Isolating people with the virus (and their close contacts) and social distancing can reduce how many people get sick. Slowing the spread of the virus reduces the need for health care to a level we can provide.

The initial modelling shows a scenario of an uncontrolled outbreak. In that scenario, peak daily Intensive Care Unit (ICU) bed demand is 35,000, which would greatly exceed Australia's expanded capacity of 7,000 ICU beds. With isolation and quarantine, demand is reduced to 17,000 ICU beds at its peak, still well above expanded capacity. With isolation, quarantine and social isolation daily demand is reduced to below 5,000.

The tougher the restrictions, the bigger the impact, but the longer the outbreak continues. **Modelling is a useful tool but it does not predict the future**. In the real world, we can adjust restrictions as the outbreak evolves to manage the length of the outbreak.

The modellers will publish the full technical detail behind this initial work.

This document focuses on whether we would have enough ICU beds to cope with COVID-19 case numbers, should a large outbreak occur. Such an outbreak is now much less likely, given the controls National Cabinet has put in place. However, this issue remains of concern to many Australians and to those responsible for the delivery of health services.

Planning a response

A pandemic is the worldwide spread of a new disease against which most people have no immunity. Every pandemic is different. Initially we don't know:

- when or where it will arise
- how it will spread
- how many people will get sick
- how severe their illness will be
- who will be most vulnerable

Pandemic planning involves anticipating possible scenarios before they happen and planning a response. The goal is to reduce illness and death. Modelling allows us to examine possible disease spread trajectories and the effect of alternative responses.

Future modelling will account for the actions taken by the National Cabinet. These include:

- restricting travel
- isolating people with the virus and their contacts
- social distancing
- growing health system capacity

Our response to COVID-19

There are no medicines or vaccines for COVID-19 at this time. We must rely on public health interventions to control the disease. These fall into six areas:

- identifying cases
- isolating cases
- tracing and quarantining contacts of cases
- improving hygiene
- restricting travel
- social distancing

The more effective these isolation and distancing measures, the slower the spread of the disease. This means care will be available when and where Australians need it.

COVID-19 is a respiratory infection, as is influenza.

Australia has been preparing for an influenza pandemic for more than 10 years. A network of Australian experts has undertaken extensive planning and modelling. Since late January 2020 we have been working with those experts to adapt the plans and models for COVID-19.

Modelling for COVID-19 involves making assumptions about how the virus behaves. Under the Pandemic Plan the Australian Government immediately started to develop possible scenarios. We used early data from China and other countries and our understanding of how other coronaviruses behave. The model also considers the impact of different levels of isolation and distancing.

Appendix A provides some of the modelling assumptions.

The modelling does not specifically address the numbers of deaths from COVID-19 in Australia. As at 6 April 2020, less than 1% of Australians diagnosed with COVID-19 had died, aged between 60 and 94.

Modelling the impact on intensive care capacity

As we have seen overseas, an uncontrolled pandemic can quickly overwhelm a health system. International experience and our modelling show ICUs are the most vulnerable part of the health system. Expanding other parts of the health system (primary care clinics, general hospital beds) is much easier.

The baseline for the modelling is not a realistic scenario. It is a theoretical, uncontrolled pandemic. It assumes the virus moves through the community with each infected person spreading it to 2.5 other people. It assumes no health system or community action to slow the spread.

This is not what is happening in Australia. We already have strong controls in place. Governments, businesses and the community are acting. We are expanding the capacity of our health system, including increasing ICU capacity to over 7,000 beds.

Our actions mean the virus is not spreading freely or evenly. Outbreaks are occurring in pockets and being contained.

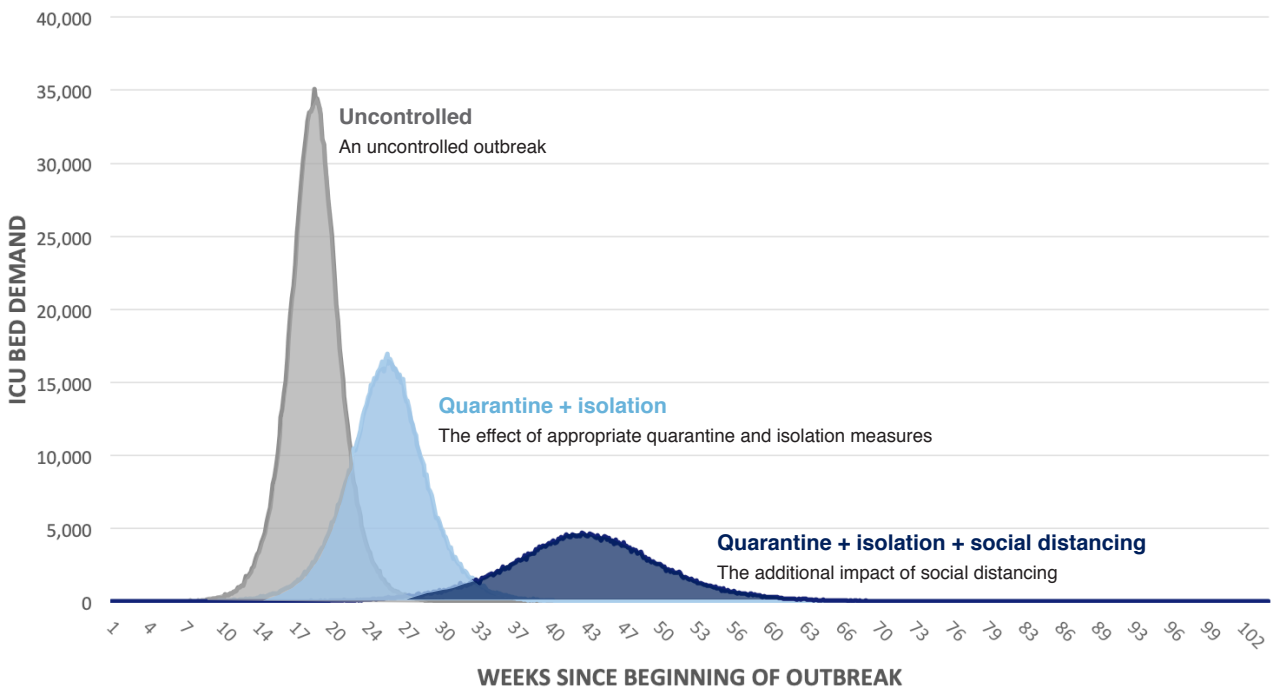
There are still things we don't know. Modelling does not predict the future. It is a tool to explore scenarios and the impact of actions we might take.

The figures below shows three scenarios from the modelling:

an uncontrolled outbreak
the effect of appropriate quarantine and isolation measures
the additional impact of social distancing

These are the modelled outcomes. They do not take account of the specific measures Australian governments have implemented.

Modelling COVID-19 scenarios



The theoretical modelling finds an uncontrolled COVID-19 pandemic scenario would overwhelm our health system for many weeks. 89% of people would catch the virus, with 38% requiring some medical care. ICUs would be stretched well beyond capacity for a prolonged period. Only 15% of people requiring ICU beds would be able to access one, even with the expanded ICU capacity in the model.

Quarantine and isolation slow the rate of transmission. This flattens the epidemiological curve. It reduces the proportion of people who would catch the virus to 68%, and those needing medical care to 29%. While this reduces the peak demand on ICUs, the modelled expanded ICU capacity would not be enough for several weeks. Only an estimated 30% of people requiring ICU beds would be able to access them.

Social distancing makes it harder for the virus to spread and reduces the proportion of people infected.

The modellers have looked at two levels of social distancing. With a 25% reduction in transmission due to social distancing, the proportion of people infected would be 38% with 16% requiring some medical care. Eighty% of people who need ICU beds could access them. With a 33% reduction in transmission due to social distancing, the proportion of people infected is 12% and only 5% require some medical care. Everyone who needs an ICU bed over the course of the pandemic could access one.

The modelling finds our ICUs will cope if we continue to:

- have effective social distancing,
- increase our health system capacity, and
- isolate people with the virus and their close contacts.

Isolation and social distancing together are highly effective. These measures reduce the spread of the virus, ensuring we have enough ICU capacity at each stage.

While the modelling does not show how the virus will move through our community, it tells us some important things. We would have been overwhelmed if we had not introduced a range of public health measures.

It shows we can flatten the curve. It provides confidence that if we sustain the changes we are implementing, our health system will have the capacity to meet our needs.

Broader health system capacity building

The demands on the health system will continue to be modelled and adjusted as more information becomes available. All parts of the health system have been expanded to meet potential increased demand.

- New respiratory clinics are opening.
- We are expanding emergency departments.
- We are increasing the availability of general hospital beds in public and private hospitals.

Pressure on our health system this year may be lower than usual due to:

- fewer people having influenza (due to higher vaccination rates and the measures in place for COVID-19)
- fewer serious injuries including car accidents as the result of reduced travel
- reduced elective surgery

Continuing to build the evidence base

The modelling up until now has looked at hypothetical scenarios and focused on health system capacity. The next phase is to put Australian data into the model and see how it aligns to our actual experience. As more 'real' data is put into the model its accuracy improves.

This helps us understand the impact of different strategies to minimise illness, death and the burden on the health system. It also helps us to predict the likely course of the pandemic in Australia over coming months.

Unlike many countries, we have an opportunity in Australia to choose how to respond from a position of relative control. We can tailor our interventions to gain the most benefit and minimise the cost to society.

Appendix A:

Table 1: Proportion of people with COVID-19 who require hospital and intensive care, by age

This table presents the assumptions in the current modelling about the need for hospital and intensive care

Age group (years)	% Hospitalised	% Require ICU^
0–9	0.062%	0.018%
10–19	0.062%	0.018%
20–29	0.78%	0.23%
30–39	2.9%	0.85%
40–49	5.1%	1.5%
50–59	9.9%	2.9%
60–69	15.5%	4.55%
70–79	35.8%	10.5%
80+	65.9%	19.4%
Overall		
Mean bed days for inpatients		
Hospital	7.5 days	
ICU	10 days	

Table 2: Additional modelling parameters and actual data

	Scenario 1: no mitigation	Scenario 2: quarantine and isolation	Scenario 3: quarantine, isolation and social distancing (25%)	Scenario 4: quarantine, isolation and social distancing (33%)	Actuals as at 6 April 2020
Infection rate	89.1%	67.5%	37.7%	11.6%	5,795
Hospitalisation rate	5.4%	4%	2.2%	0.8%	448 in hospital