Emerging from lockdown:
Evidence, modelling, outputs and assumptions

We are tracking ahead of the October 26 target to reach 5 cases, but there is much uncertainty

- Multiple models can be used to predict the date we will reach 5 cases.
- At small cases numbers, the exact date will depend a lot on chance.

Victoria's fortnightly case average is tipped to fall below 5 some time in October. The models all predict a very similar outcome, but the *exact date* we reach 5 cases is very uncertain.

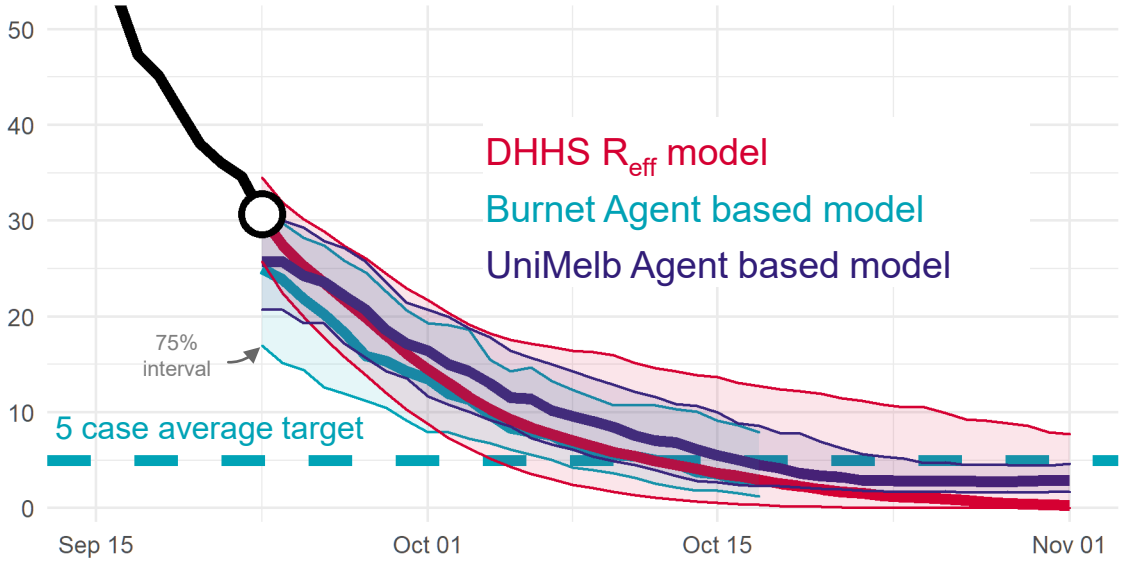
Each model has its strengths and weaknesses, but none of them can be extremely precise when case numbers are so low. One outbreak could spark many new cases, setting us back several days.

DHHS's internal R_{eff} number last week was 0.69, which is very similar to the Doherty Institute's figure of 0.75.

- The move to the Third Step is dependent on trigger points and the public health advice.
- It is important to leave time between changes (at least one incubation period) to observe their impact.

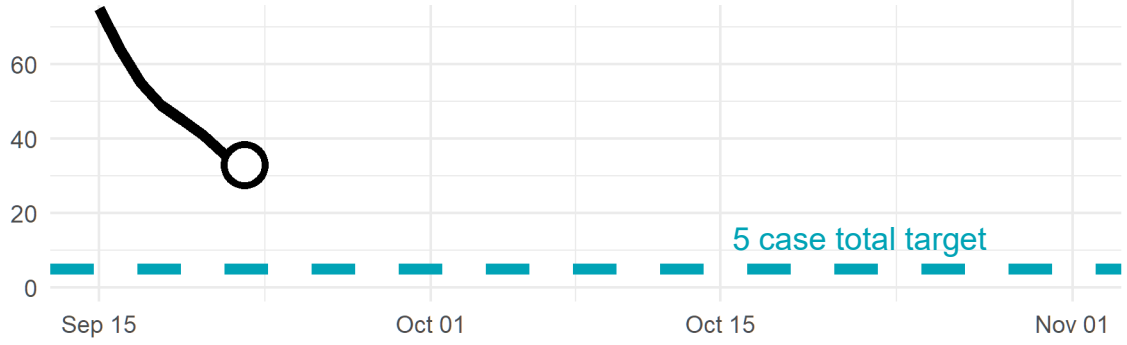
We are currently tracking to beat the October 26 target

14-day new case average



We do not model unknown source cases, but they are currently trending down

Running total over 14-days with unknown source



The Burnet model does not include step 1 and 2 of the roadmap.
DHHS and Doherty use similar, but slightly different methodologies to estimate their R_{eff} figure

New modelling from the Burnet Institute confirms that opening fully on September 28 would be dangerous

- If Victoria were to skip to the Final Step of the Roadmap on the 28th of September, there would be a 41% chance of a very large resurgence of coronavirus within four weeks.

Burnet Institute has modelled what would happen if we eased to the Final Step on the Roadmap to COVID Normal on September 28. Easing restrictions now would mean that bars and clubs could open, all workplaces could return, and small public gatherings could recommence.

Burnet Institute found that opening up too quickly would result in a 41% chance of a third wave within four weeks.

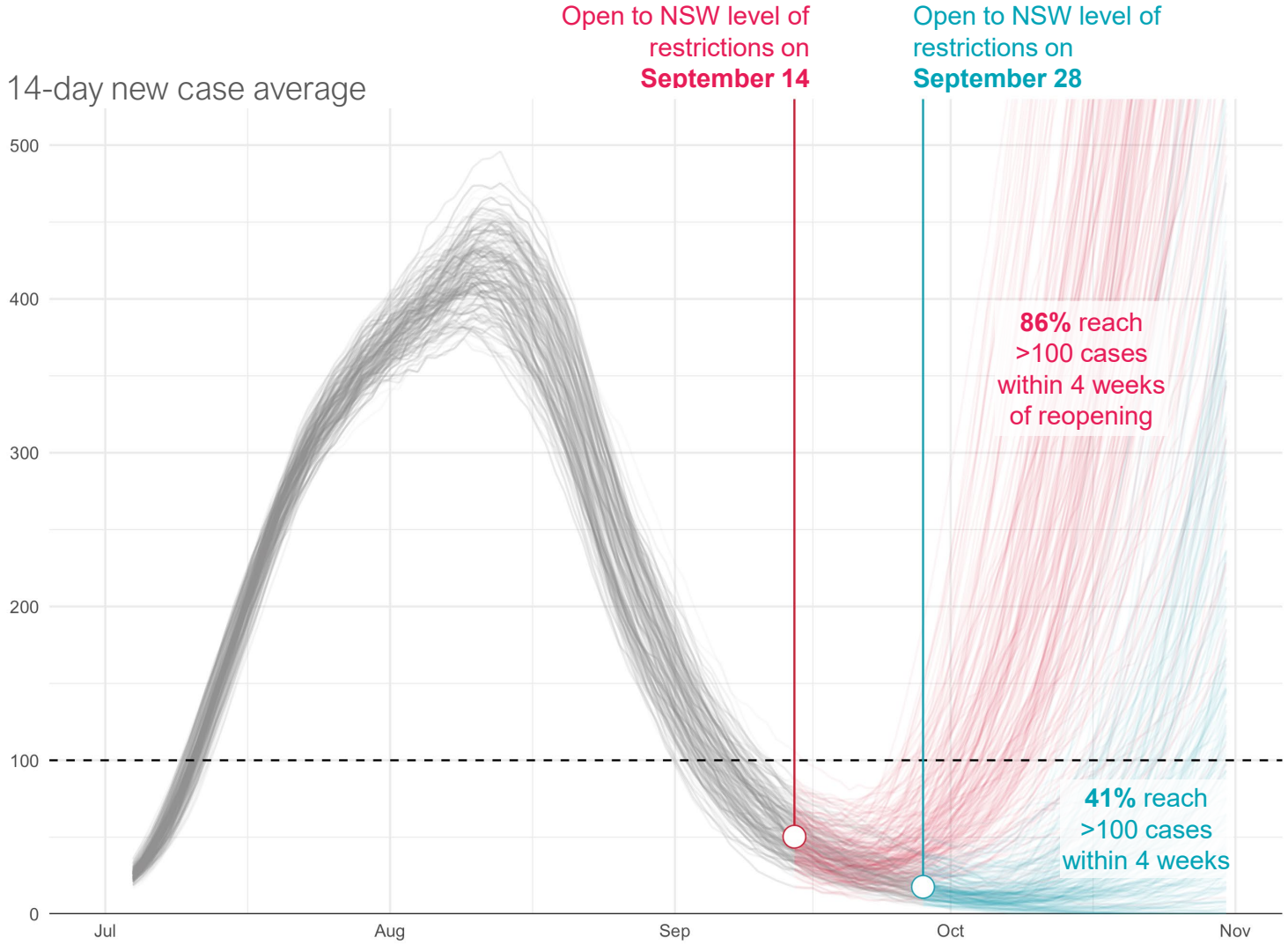
Reopening too soon risks wasting all the sacrifices Victorians have made over the last few months.

Burnet have used a slightly different approach to the University of Melbourne. It is based on data from Victoria's second wave and includes nuanced details about different socialising activities e.g. restaurants, cafes etc.

Burnet recommend:

Easing restrictions slowly.

Using trigger points to decide when to ease restrictions.



The risk of opening schools is likely lower than previously estimated, given new research conducted by the Murdoch Children's Research Institute

- New research shows that schools are unlikely to be a site of COVID outbreaks when community transmission is low.
- The evidence is stronger than children under 10 are less infectious than older children

Coronavirus is a new disease, and we are yet to fully understand exactly how it spreads. There is growing evidence that the risk of large outbreaks of SARS-CoV-2 within the school setting is low when there are low levels of the virus spreading around the community.

While very few significant outbreaks occur in schools, they do occur, and this has often been associated with high rates of community transmission and lack of adherence to social distancing in the school setting.

Murdoch Children's Research Institute has presented research to the Department using Victorian data. The report shows that the risk of COVID-19 school transmission is low when case numbers are low like in Victoria today.

Children less than 10 years old seem to transmit coronavirus less than adolescents and adults. Where young children have been infected and gone to school in Victoria, outbreaks have been very uncommon.

Murdoch Children Research Institute's research confirms internal research by the department that schools are more likely to act as a multiplier of existing community transmission rather than a driver of the epidemic.

The risks primarily relate to household transmission and increased movement, including by adults during pick up and drop off. The University of Melbourne Model captures the impact of this movement.

murdoch children's research institute

"Early Childhood Education Centres and schools should be prioritised for reopening and staying open to guarantee suitable learning environments & lessen unintended social and educational effects of school."

Sending primary back in term 4 is relatively low risk

Allowing all primary students to return to on-site learning in term 4 is unlikely to change the trajectory of case-numbers significantly by Christmas.

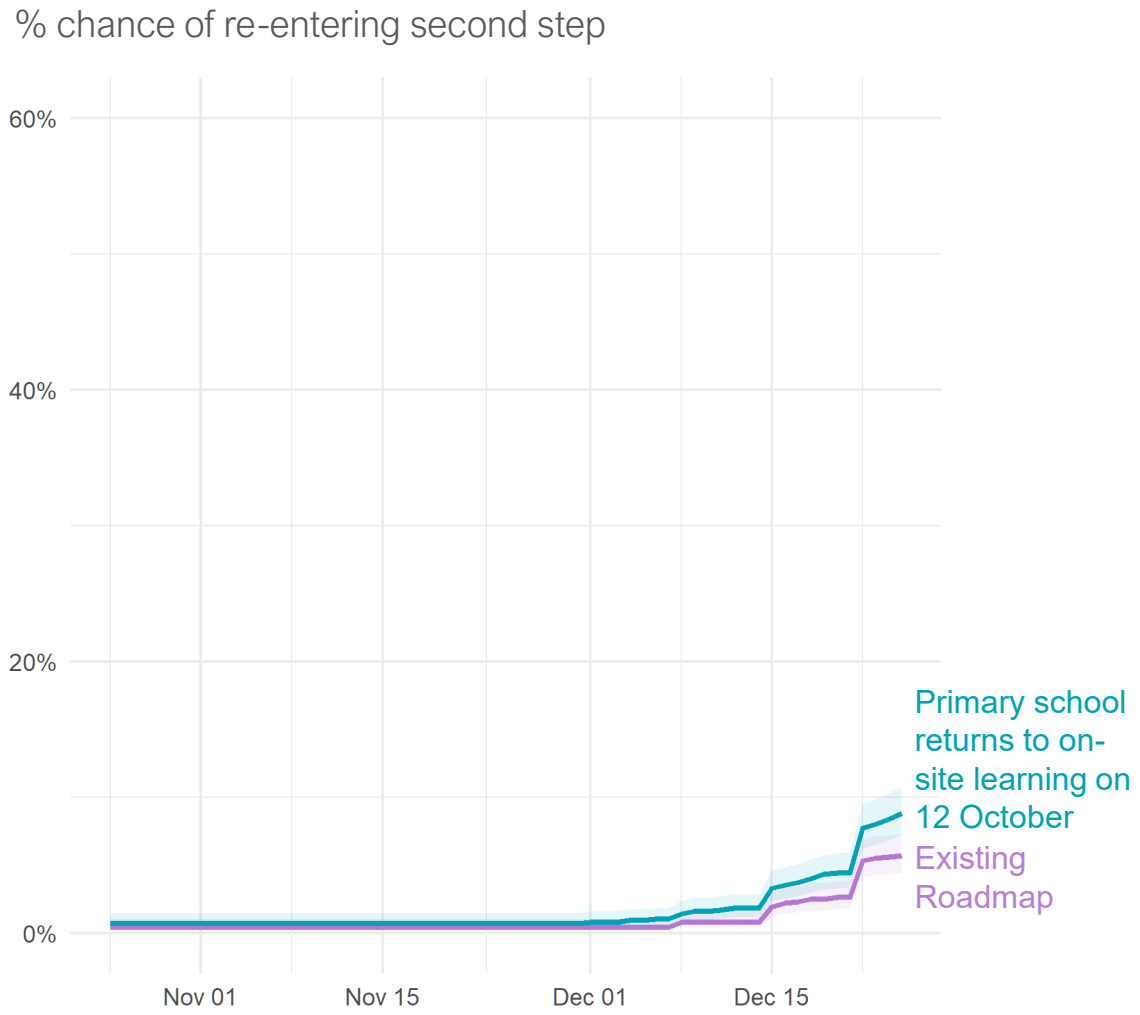
We expect that the risk for primary students is lower because of research by the Murdoch Children's Research Institute. Based on this research, the Public Health experts at the Department of Health and Human Service have asked Melbourne University to change the parameter for how infectious children are in their model.

The model's previous assumption around children younger than 10 was that they were twice as likely to be asymptomatic as adults (33% v 60%). We now assume that 90% of children under 10 are asymptomatic. This change reduces their overall infectivity compared to adults from 77% to 51%.

Using this assumption, sending primary schools back does not greatly affect the likelihood of re-entering the second step by Christmas.

There is still some risk to sending primary schools back. Extra teachers will be moving around in the community, and there will be more movement from parents for school pick-ups and drop-offs.

Every Victorian can help to reduce the risk of a third wave by wearing a mask, maintaining good hand hygiene, socially distancing, and getting tested when unwell.



Appendix: the University of Melbourne model and its authors

Authors

Melbourne University's Dynamic Policy Model (DPM) is the result of an extensive international collaboration among a multi-disciplinary team from Australia and New Zealand over many months.

Contributions have come from Melbourne University's Transport, Health and Urban Design Research Lab, and Melbourne School of Population and Global Health. Investigators from the University of New England School of Health Sciences and Medicine, and University of Otago have also been closely involved over the course of its development.

This model has been peer-reviewed, and presented for critique at state, national, and international level. It has been published in the Medical Journal of Australia[1]. It continues to be updated and enhanced as the pandemic progresses. In addition to its use in the current context, previous uses, parameters, and iterations of the model and a complete list of contributors can be seen here, here, and here.

[1]Blakely et al (2020) The probability of the 6-week lockdown in Victoria (commencing 9 July 2020) achieving elimination of community transmission of SARS-CoV-2. Med J Aust 2020.

The model

The University of Melbourne's agent-based dynamic policy model (DPM) for COVID-19 imagines a simplified world where people (agents) move around like pieces on a chess board. Each person has their own characteristics. Some are old, some are young, some go to work and some go to school. Some are very infectious when they get COVID-19, and some are not.

If a person moves into the same square as another person who has COVID-19, they may catch the virus. People can reduce their risk by avoiding other people, keeping 1.5m distance or wearing a mask. If a person becomes infected and is traced by the health system, they are isolated and are less likely to infect others. As greater (or lesser) restrictions are imposed by the DPM, people change the way they move around the chess board. Following restrictions, some may stay at home more, or deliberately try to avoid interacting with others. If case numbers decline and restrictions are loosened, agents' mobility and interactions increase.

Agent based models are used throughout academia to model phenomena as diverse as infectious diseases, economics, and transport.

The DPM has parameters that are based on the disease mechanics of COVID-19, and have been validated against Australia and New Zealand's first and second wave of infections. This means that the model is helpful in predicting more likely outcomes of changes in social and health policies related to social contact and therefore, disease transmission.

Appendix: the Burnet model and its authors

Authors

The modelling presented from the Burnet institute is an adaptation of the existing Covasim Epidemic model, developed by the Institute for Disease Modelling (USA), calibrated to the Victorian epidemic.

Primary contributors are:

- Dr Nick Scott, Head, Modelling Working Group, Burnet Institute; Adjunct Senior Research Fellow, Department of Epidemiology and Preventive Medicine, Monash University.
- Dr Romesh Abeysuriya, Senior Research Officer, Modelling Working Group, Burnet Institute; Adjunct Research Fellow, Department of Epidemiology and Preventive Medicine, Monash University, and
- Professor Margaret Hellard, Deputy Director Burnet Institute; Head, Hepatitis Hepatitis Services, Department of Infectious Diseases The Alfred Hospital; Adjunt Professor, Infectious Diseases Epidemiology, Department of Epidemiology and Preventive Medicine, Monash University; Adjunct Professor, Doherty Institute and School of Population and Global Health, University of Melbourne

This model has been peer reviewed and published in the Medical Journal of Australia. A detailed explanation of model parameters is available online within the supplementary information at:

Scott N, Palmer A, Delport D, Abeysuriya R, Stuart R, Kerr CC, Mistry D, Klein DJ, Sacks-Davis R, Heath K et al (2020) *Modelling the impact of reducing control measures on the COVID-19 pandemic in a low transmission setting.* Med J Aust

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The model

The Burnet institute's Covasim model imagines a simplified world where the lives of individuals (agents) are summarised by their contacts with other people. These contacts might be people they live with, go to school or work with, or interact with in community settings.

Each day, a person who is involved in the same social or work environment as another person who has COVID19 may become infected. This risk is mitigated by policies in the model, which can reduce the number of contacts that people have or the likelihood of transmission per contact. These policies can target multiple activities, in the case of the $4m^2$ rule or mandatory mask wearing, or cease an activity entirely in the case of pubs and bars.

Covasim focuses on daily community activities such as attending restaurants, pubs, places of worship, community sport and small social gatherings. This allows changes affecting each of these specific contexts to be investigated explicitly. Within Covasim, testing and contact tracing is performed using these contexts, with the likelihood of successfully identifying contacts informed by the ways in which the agents know each other. For example, household contacts are significantly more likely to be found than those on public transport.

Calibration of key disease transmission parameters was performed based on daily new detected cases and hospitalisations from the COVID-19 outbreak in Victoria over the June-September period. This means that the model is helpful in predicting more likely outcomes of changes in social and health policies related to social contact and therefore, disease transmission.