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Letter to the Editor

Early signs that COVID-19 is being contained in Australia

The COVID-19 pandemic is overwhelming many national healthcare networks and crippling many economies. As of 24 April 2020 (11:08AM GMT), a total of 2721,354 confirmed cases, 191,231 deaths and 745,605 recovered cases have been recorded in over 150 countries.\(^1\) To date, the reported case-fatality varies from 2.3% (in China) to 7.2% (in Italy), with substantially higher fatality among older populations, and those with co-morbidities.\(^2\)

Australia has a population of approximately 26 million, of whom 15.4% are aged 65 years and above.\(^3\) The first case of COVID-19 infection was reported on 26 January 2020. As of 24 April 2020, there were 6675 known cases, and 78 deaths. Both the federal and state/territory governments have enforced strict public health measures to control this outbreak.\(^4\) In the present study, we report on the epidemiology of the COVID-19 outbreak in Australia observed thus far, as well as the predicted future numbers of cases, deaths and ICU admissions, and associated ICU costs.

In 2018–2019, total ICU capacity across public and private hospitals in Australia comprised 2229 beds, and the mean cost of each ICU bed-day was AUD $5040.\(^5\)\(^,\)\(^6\) We forecasted the number of beds required for COVID-19 patients over time and its associated costs by applying the following conditions: (i) allocation of 10%, 30% and 50% of ICU beds for COVID-19; (ii) 3% (as currently observed in Australia), 5% (China) and 12% (Italy) of confirmed cases requiring intensive care;\(^7\) (iii) mean ICU stay between 7 and 14 days; and (iv) mean hospital stay prior to intensive care between 7 and 14 days.\(^8\)

Evaluation of temporal changes in trend and dynamic time series forecasting were performed by Box-Jenkins autoregressive integrated moving average and regression models. Predicted models were validated by review of mean absolute percentage errors and r-squared values.

We estimated the mortality rate by dividing the number of deaths on a given day by the number of patients with confirmed COVID-19 infection (i) on the same day and (ii) seven days before, given that patients who die on any given day were infected much earlier. On this basis, case fatality from COVID-19 infection in Australia is presently between 0.4% to 3.0%. Fig. 1 depicts the number of new cases observed over time. The number of new cases have decreased since 29 March 2020, with New South Wales, Victoria, Queensland and South Australia all reporting less new cases in the three to five days prior (Supplement Figures A and B). Hence the rate of rise in incidence has slowed, mindful of the limitations of applying trends to short periods of time. Based on extrapolation of trends prior to 29 March 2020, the Australian healthcare system would have been over-run by over 12,000 confirmed cases by 12 April 2020 (Supplement Figure C). Furthermore, ICU capacity would have been exceeded by mid to end April 2020 (Supplement Figure D). The associated ICU costs would have amounted to between AUD $8.82 million and $34.38 million if capped at the current maximum number of ICU beds. Notably, Australia has successfully averted these outcomes through timely implementation and strict enforcement of bans on travel and social gatherings, as well as concerted diagnostic and management strategies.

The results of our analysis suggest that Australia is on its way joining China and South Korea in ‘flattening the curve’.
Fig. 1. Public health measures undertaken to contain COVID-19 in Australia.

| No. | Date         | Public health measures                                                                                                                                 |
|-----|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 31 Jan 2020  | Day 7 - Foreign nationals returning from China were required to spend a fortnight in a third country before being allowed into Australia.           |
| 2   | 27 Feb 2020  | Day 34 - Australian Health Sector Emergency Response Plan for Novel Coronavirus (COVID-19) activated.                                                  |
| 3   | 29 Feb 2020  | Day 36 - Government extended the enforced quarantine to people returning from Iran, requiring them to spend a fortnight in a third country before being allowed into Australia. |
| 4   | 5 March 2020 | Day 41 - Travel ban on South Korea.                                                                                                                     |
| 5   | 11 March 2020| Day 47 - Travel ban on Italy.                                                                                                                           |
| 6   | 13 March 2020| Day 49 - Formation of a national crisis cabinet.                                                                                                         |
| 7   | 15 March 2020| Day 51 - All travellers arriving in or returning to Australia must self-isolate for 14 days.                                                    |
| 8   | 18 March 2020| Day 54 - Human biosecurity emergency was declared in Australia.                                                                                           |
| 9   | 20 March 2020| Day 56 - Australia would be closing its borders to all non-residents and non-Australian citizens.                                                    |
| 10  | 21 March 2020| Day 57 - Social distancing rule of 4 square metres (43 sq ft) per person in any enclosed space was imposed.                                            |
| 11  | 23 March 2020| Day 59 - Closure of places of social gathering, including registered and licensed clubs, licensed premises in hotels and bars, entertainment venues, including but not restricted to cinemas, casinos and nightclubs and places of worship. Cafes and restaurants are to remain open, but limited to takeaway only. Similarly, enclosed spaces for funerals and things of that nature will have to follow the strict four square metre rule. |
| 12  | 24 March 2020| Day 60 - Victoria state closes public schools.                                                                                                           |
| 13  | 25 March 2020| Day 61 - National COVID-19 Coordination Commission (NCCC) was established by the Prime Minister.                                                           |
| 14  | 27 March 2020| Day 63 - All States and Territories announced plans in relation to earlier end of Term One in public schools. The announcements include altering the dates, encouraging parents to keep children at home and/or having limited supervision/pupil free days in the last week of term for Government schools, except for the ACT which announced three weeks of pupil-free days. Across all jurisdictions provisions are still being made during those days for children of 'essential workers' , a term loosely defined and largely any worker who needs to send their child to school, on school sites. |
| 15  | 29 March 2020| Day 65 - Two person rule was announced by the Prime Minister, limiting gatherings to maximum of 2 people.                                                 |
Declaration of Competing Interest

None

Authors contributions

KLC designed the study and performed the analysis. All authors contributed to manuscript preparation and revision for intellectual content. All authors approved final manuscript version prior to submission.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jinf.2020.04.042.

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Ken Lee Chin*
Department of Epidemiology and Preventive Medicine, Monash University, Melbourne Medical School, University of Melbourne Melbourne Medical School, University of Melbourne, Victoria, Australia

Richard Ofori-Asenso
Department of Epidemiology and Preventive Medicine, Monash University, Melbourne Medical School, University of Melbourne Copenhagen Centre for Regulatory Science, Department of Pharmacy, University of Copenhagen, Copenhagen, Denmark

Kaylee A. Jordan
Department of Anaesthesia and Pain Management, Royal Melbourne Hospital, Melbourne, Australia

Daryl Jones
Department of Epidemiology and Preventive Medicine, Monash University, Melbourne Medical School, University of Melbourne Austin Health, Melbourne, Australia

Department of Surgery, University of Melbourne Victoria, Australia

Danny Liew
Department of Epidemiology and Preventive Medicine, Monash University, Melbourne Medical School, University of Melbourne

*Corresponding author.
E-mail address: ken.chin@unimelb.edu.au (K.L. Chin)