Vaccinating Australia: How long will it take?

A Preprint

Mark Hanly
Centre for Big Data Research in Health
UNSW Sydney
Sydney 2052
m.hanly@unsw.edu.au

Tim Churches
Ingham Institute for Applied Medical Research
South Western Sydney Clinical School, Faculty of Medicine, UNSW Sydney
Liverpool
timothy.churches@unsw.edu.au

Oisín Fitzgerald
Centre for Big Data Research in Health
UNSW Sydney
Sydney 2052
o.fitzgerald@unsw.edu.au

Louisa Jorm
Centre for Big Data Research in Health
UNSW Sydney
Sydney 2052
l.jorm@unsw.edu.au

January 27, 2021

Abstract

Enter the text of your abstract here.

***K*eywords** COVID19 · vaccination

1 Introduction

- Internationally, COVID19 continues to have devastating health and economic impacts.
- In Australia, we have escaped much of the worst of the health impacts, through a combination of border closures, lock down measures and effective track and trace.
- However this has come at a massive cost for many industries, including tourism, airlines, retails, the arts , international students etc.
- A safe and effective vaccine is the best bet to return to normal.
- Several viable vaccines have been developed or are close to completion, and Israel, The US and the UK have already begun to roll out national vaccination programs.
- The Australian government has procured the Phizer and Astra-Zeneca vaccines (others?) and have released a national rollout strategy.
- This strategy identifies 16 populations groups, ranked in priority across five vaccination phases (see Table 1).
- Hospital hubs with cold chain storage facilities will administer the Phizer vaccine to the highest priority groups scheduled in Phase 1a.
- Target of 80,000 vaccinations a day.

- A back of the envelope calculation would suggest it would take 500 days to vaccinate 20 million adult Australians twice.
- But there are some complications e.g. timing of second doses and vaccine hesitancy; we are going to need a bigger envelope.
- Aim of this analysis is to calculate how long it will take the vaccinate the whole Australian population

Table 1: Australia's COVID-19 vaccine national roll-out strategy

Phase	Description	Size
1a1	Quarantine & border workers	70,000
1a2	Frontline health care workers	100,000
1a3	Aged care and disability care staff	318,000
1a4	Aged care and disability care residents	190,000
1b1	Elderly adults aged 80 years and over	1,045,000
1b2	Elderly adults aged 70-79 years	1,858,000
1b3	Other health care workers	953,000
1b4	Aboriginal and Torres Strait Islander people aged 55 years and over	87,000
1b5	Younger adults with an underlying medical condition	2,000,000
1b6	Critical and high risk workers	196,000
2a1	Adults aged 60-69	2,650,000
2a2	Adults aged 50-59	3,080,000
2a3	Aboriginal and Torres Strait Islander people aged 18-54	387,000
2a4	Other critical and high risk workers	453,000
2b	Balance of adult population	6,643,000
3	<18 if recommended	5,670,000

Adapted from https://www.health.gov.au/sites/default/files/documents/2021/01/australia-s-covid-19-vaccine-national-roll-out-strategy.pdf

2 Methods

- Vary three factors with two levels each resulting in 8 scenarios (see Table 2)
- Daily vaccination capacity (60,000 versus 80,000)
- Timing between first and second dose (3 to 6 weeks, versus 3 to 12 weeks)
- Vaccine hesitancy (7% versus 13%) based on recent survey data from Edwards et al (the projections assume taht hesitancy applies to general population groups but not to health or border workers, age care residents or those with an underlying condition)
- Assume that the vaccine is administered according to the priority phases set out by the government
- All groups within a given phase are given equal priority
- Daily capacity is first divided between those needing second dose to ensure all second doses are delivered within the specified window; the remainder of the daily capacity distributed among those requiring their first dose.

Table 2: Projection scenarios

Scenario	Capacity (units per day)	Gap between doses	Hesitancy
1	80,000	3 to 6 weeks	7%
2	80,000	3 to 6 weeks	13%
3	80,000	3 to 12 weeks	7%
4	80,000	3 to 12 weeks	13%
5	60,000	3 to 6 weeks	7%
6	60,000	3 to 6 weeks	13%
7	60,000	3 to 12 weeks	7%
8	60,000	3 to 12 weeks	13%

3 Results

- Under the most optimistic Scenario (Scenario 1), assuming vaccination starts on March 1, the highest priority group would be fully vaccinated with two doses by April 16th, just over six weeks (see Table 4).

- However it would still take nearly nine months to complete Phase 2a, which includes adults aged 60-69 years.

- It would take until July 2022 to fully vaccinate the adult population and a further four months after that to vaccinate those under 18.

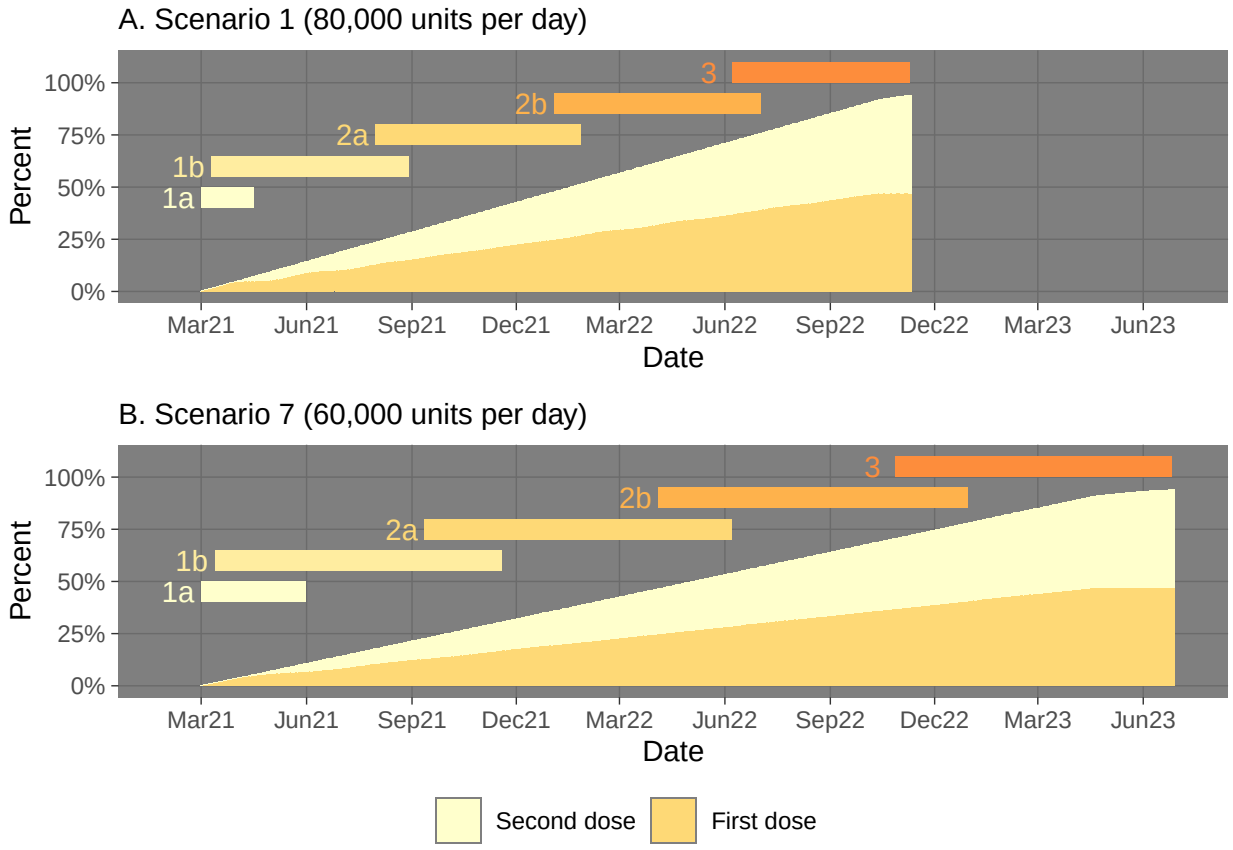
- Under this scenario, we would reach 50% population coverage in February 2022 and 75% population coverage in July 2022 (See Figure 1A)

- Under less optimistic scenarios it would take until the end of 2022 to vaccinate the adult population. (see Table 4)

- Under this scenario, we would reach 50% population coverage in May 2022 and 75% population coverage in December 2022 (See Figure 1B)

Table 3: Summary of vaccine rollout projects for different scenarios

Scenario	Number of vaccinations	Individuals vaccinated	Population coverage	Phase 1a complete	Phase 1b complete	Phase 2a complete	Phase 2b complete	Phase 3 complete
1	48,337,780	24,168,890	94.0	16/04/21	29/08/21	26/01/22	02/07/22	09/11/22
2	45,713,020	22,856,510	88.9	16/04/21	28/08/21	12/01/22	07/06/22	05/10/22
3	48,337,780	24,168,890	94.0	28/05/21	29/09/21	23/02/22	29/07/22	08/12/22
4	45,713,020	22,856,510	88.9	28/05/21	27/09/21	09/02/22	05/07/22	06/11/22
5	48,337,780	24,168,890	94.0	19/04/21	25/10/21	11/05/22	03/12/22	26/05/23
6	45,713,020	22,856,510	88.9	19/04/21	22/10/21	21/04/22	28/10/22	16/04/23
7	48,337,780	24,168,890	94.0	31/05/21	18/11/21	07/06/22	30/12/22	26/06/23
8	45,713,020	22,856,510	88.9	31/05/21	12/11/21	20/05/22	29/11/22	14/05/23



4 Discussion

- Don't book your summer holidays just yet.

5 Examples of citations, figures, tables, references

The documentation for `natbib` may be found at

`http://mirrors.ctan.org/macros/latex/contrib/natbib/natnotes.pdf`

Of note is the command `\citet`, which produces citations appropriate for use in inline text. For example,

```
\citet{hasselmo} investigated\dots
```

produces

Hasselmo, et al. (1995) investigated…

`https://www.ctan.org/pkg/booktabs`