Covid-19 In Australia

Sudeshna Anjankar

Analysis of Covid-19 Cases and Deaths in Australia

1. Introduction

We are going to analyse data from the COVID Live website (https://covidlive.com.au), which provides daily and historical COVID-19 statistics for all Australian states and territories. For the purpose of this analysis, we focus on four major states: New South Wales (NSW), Victoria (VIC), Queensland (QLD), and South Australia (SA). These states account for the majority of Australia's population and reported cases, making them ideal for a comparative and trend-based evaluation.

The data includes two key variables:

- The number of confirmed COVID-19 cases

- The number of reported COVID-related deaths

These figures were obtained through web scraping using the rvest package in R. The data was then cleaned, combined, and normalized per 100,000 population using official ABS state population figures from December 2024.

The dataset spans from early 2020 to mid-2025, capturing the number of newly confirmed COVID-19 cases and deaths, normalized per 100,000 people to allow fair comparisons across states of different population sizes.

A. The number of total confirmed COVID-19 cases:

| State	Start Date	End Date	Min Cases	Avg. Total Cases	Max Cases
New South Wales	2020-01-27	2025-06-21	0	24,360	50,630
Queensland	2020-01-29	2025-06-21	0	19,397	35,832
South Australia	2020-02-02	2025-06-21	0.1	32,010	54,146
Victoria	2020-01-29	2025-06-21	0	19,969	44,047

Table 1: Overall covid cases

As shown in the above table and the trend graph, South Australia recorded the highest total number of confirmed cases per 100,000 people (54,146), followed by New South Wales (50,630), Victoria

(44,047), and Queensland (35,832). Initial values in 2020 were close to zero for all states, with exponential growth occurring primarily between 2021 and 2022, before gradually increasing.

Cumulative COVID-19 Cases per 100,000 (2020–mid 2025)
Total confirmed cases per 100,000 people, normalized by population
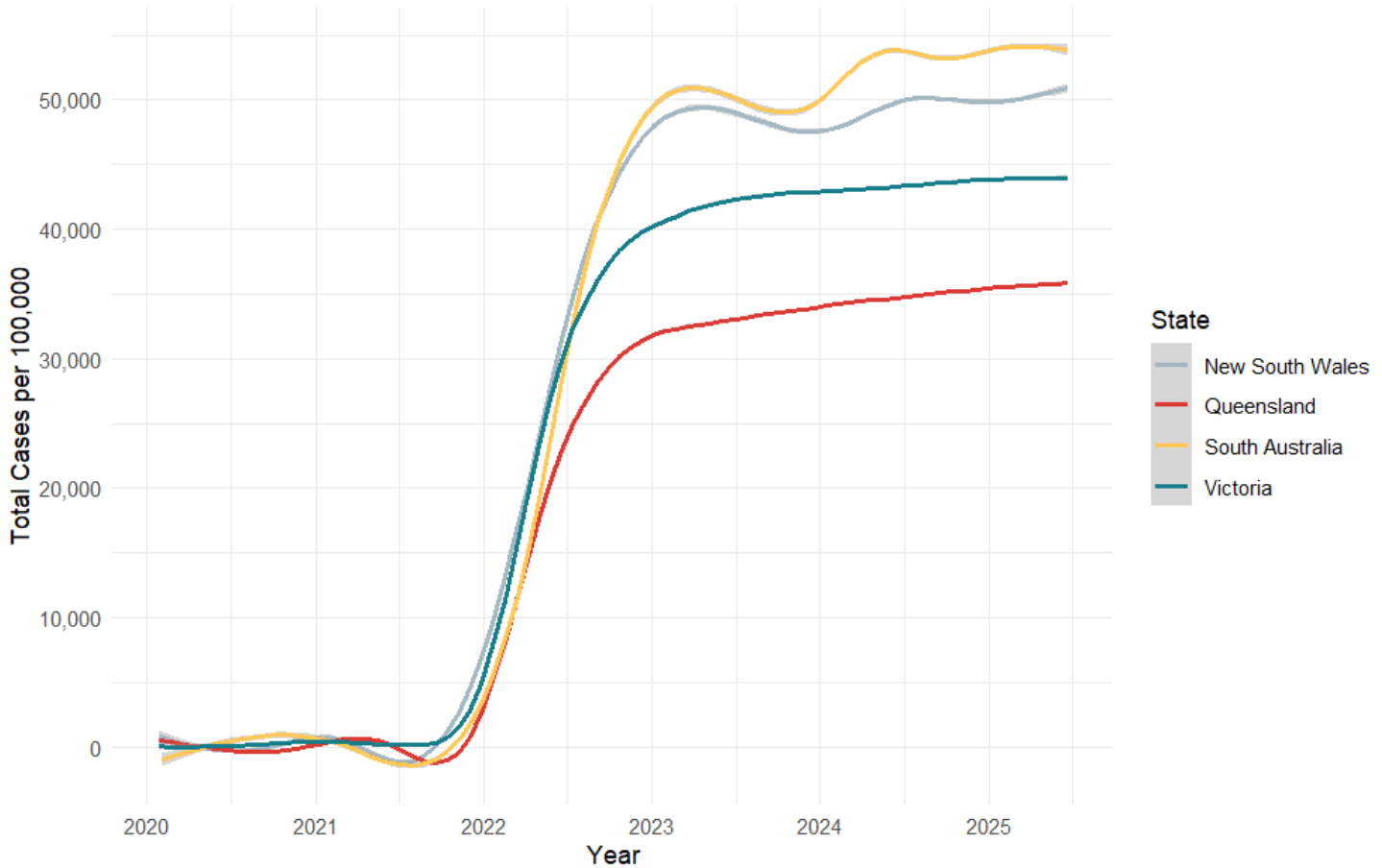
**Graph 1: Cumulative covid-19 cases per 100K population**

The graph above shows how COVID-19 cases increased quickly in all four states between late 2021 and mid-2022. After that, the number of cases grew more slowly and became more stable. The graph helps us see when each state had the highest number of cases and how the situation changed over time.

B. The number of reported COVID-related deaths:

The table below shows how reported deaths increased in each state over time. Victoria recorded the highest total deaths per 100,000 (140), followed by South Australia (108), New South Wales (92.8), and Queensland (65.9). Death counts were near zero until early 2022, then rose quickly, and began to stabilise by mid-2024.

State	Start Date	End Date	Min Deaths	Avg. Total Deaths	Max Deaths
New South Wales	2020-01-27	2025-06-21	0	43.4	92.8
Queensland	2020-01-29	2025-06-21	0	32.8	65.9
South Australia	2020-02-02	2025-06-21	0	55.6	108.0
Victoria	2020-01-29	2025-06-21	0	59.5	140.0

Table 2: Overall reported deaths
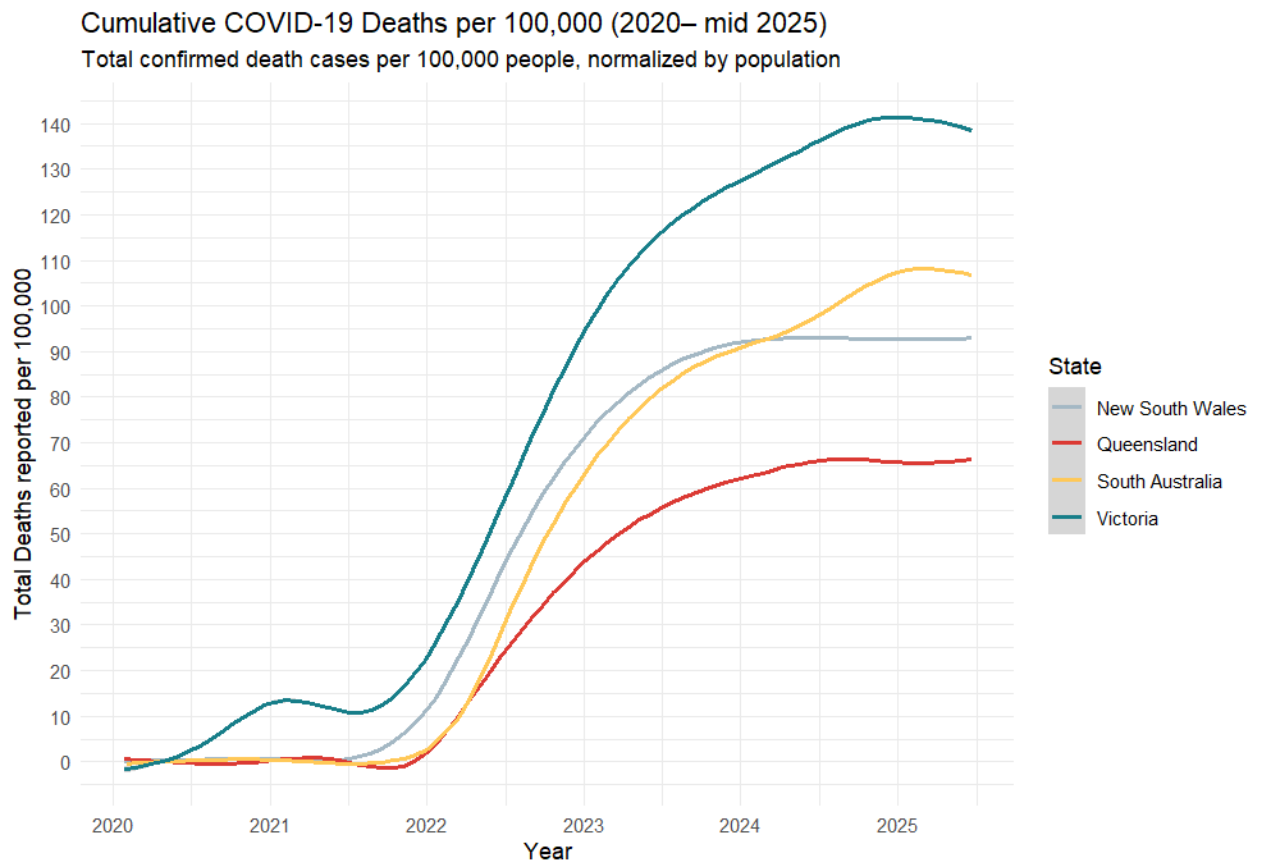
Graph 2: Overall reported Covid-19 deaths

The graph shows the rise in cumulative COVID-19 deaths per 100,000 from 2020 to mid-2025. Most deaths occurred between 2022 and 2024, with growth slowing down in the final year across all states.

2. Pandemic of COVID-19 and Its Aftermath

This section focuses on the development of COVID-19 cases in New South Wales, Victoria, South Australia, and Queensland over the past 24 months (May 2023 – June 2025). The analysis includes both

the cumulative case growth over time and the distribution of monthly new cases, offering insight into how the pandemic progressed in different regions.

2.1 Cumulative Case Trends (May 2023 – June 2025)

The table shows how the total number of confirmed COVID-19 cases (per 100,000 population) increased in each state over the past two years.

State	Start Value (May 2023)	End Value (June 2025)
South Australia	125.0	6,398.0
New South Wales	144.0	3,975.0
Queensland	64.4	3,284.0
Victoria	91.9	2,427.0

Table 3: Cumulative reported cases

Between May 2023 and June 2025, all four states experienced significant increases in cumulative COVID-19 cases per 100,000 population. South Australia recorded the highest increase, rising from 125 to 6,398 cases per 100k. New South Wales followed with an increase from 144 to 3,975, while Queensland and Victoria started from lower baselines and ended at 3,284 and 2,427 respectively. The data shows that South Australia's growth was nearly double that of any other state during this period.
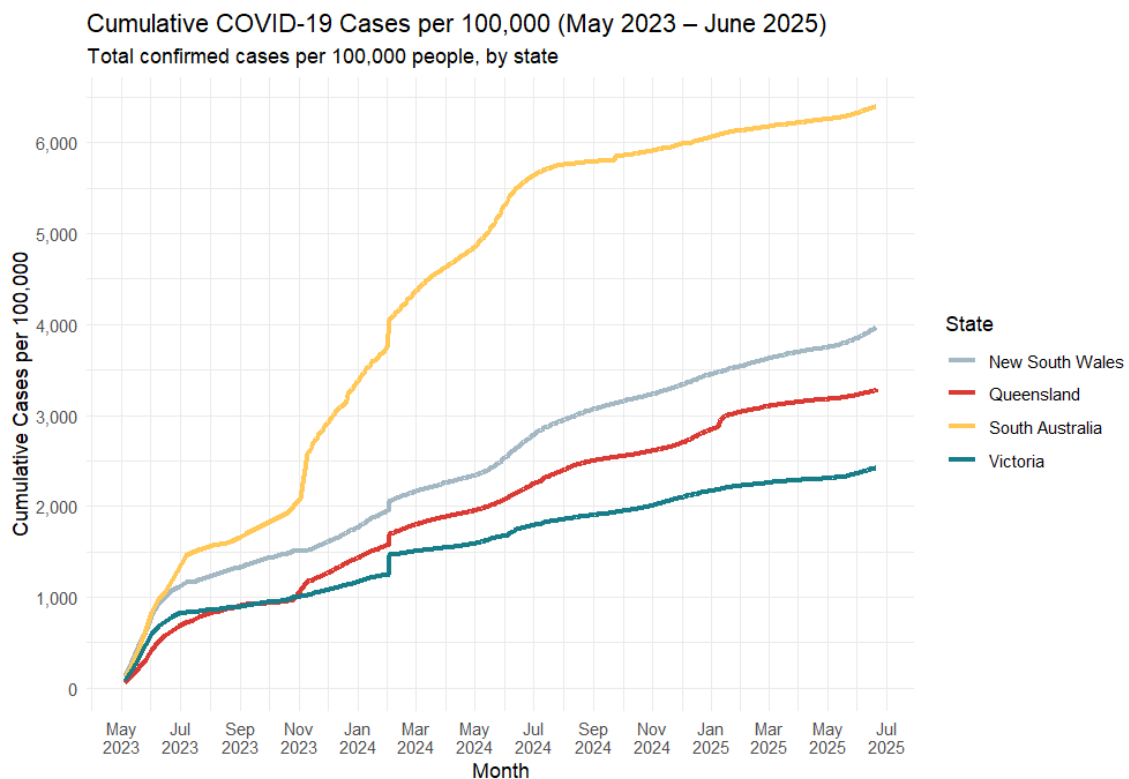

Graph 3: Cumulative reported cases

The graph shows how South Australia had the steepest rise, especially in the first half of the period. New South Wales and Queensland also showed steady increases, while Victoria had the slowest overall growth. The trends highlight differences in the scale and timing of case surges across states.

2.2 Monthly Case Distributions by State

The box plot illustrates the spread and variation of monthly new cases per 100,000 for each state over the same period.
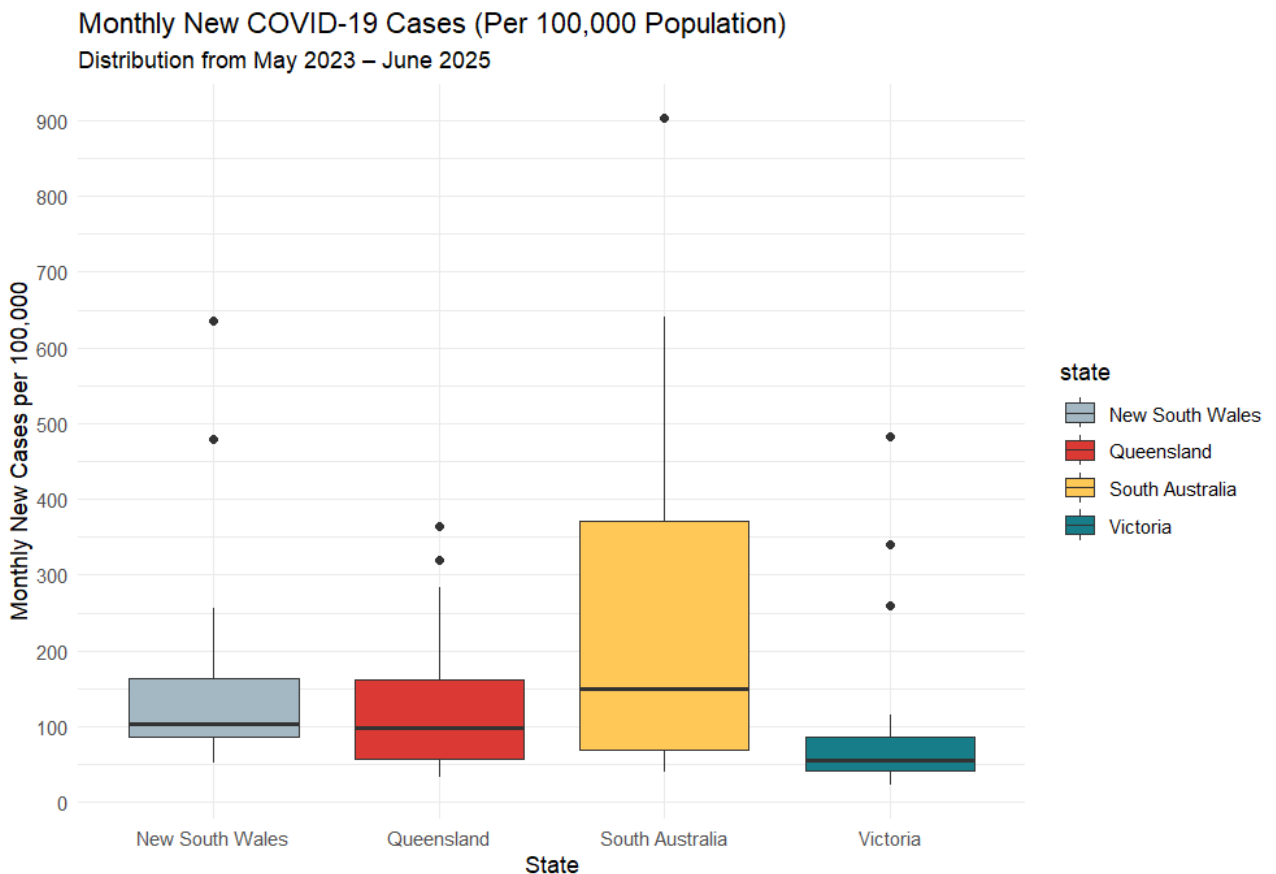
Graph 4: Monthly new reported cases

South Australia shows the widest spread and the highest outliers, indicating more monthly variation. Victoria had consistently lower monthly case counts with less variation. Queensland and NSW show similar medians, but Queensland had slightly more low-value months.

| State	Minimum	Maximum	Average
New South Wales	52.0	636.0	153.0
Queensland	32.2	364.0	126.0
South Australia	39.4	904.0	246.0
Victoria	22.9	482.0	93.3

Table 4: Monthly new reported cases

The table shows the monthly spread of new COVID-19 cases per 100,000 people for each state over the last 24 months. South Australia had the highest average (246) and peak (904) monthly case rates, indicating strong variation and larger outbreaks. New South Wales also showed a wide range (52 to 636) but with a lower average. Victoria had the lowest average monthly rate (93.3), while Queensland maintained a relatively stable distribution with moderate peaks.

3. COVID-19 Deaths and Predictions for 2024–2025

In this section we will look at the distribution of reported COVID-19 deaths in New South Wales, Victoria, South Australia, and Queensland from 2020 onward. The relationship between new cases and new deaths per 100,000 population, and uses that relationship to predict death rates for 2024 and 2025.

3.1 Yearly Death Distribution by State
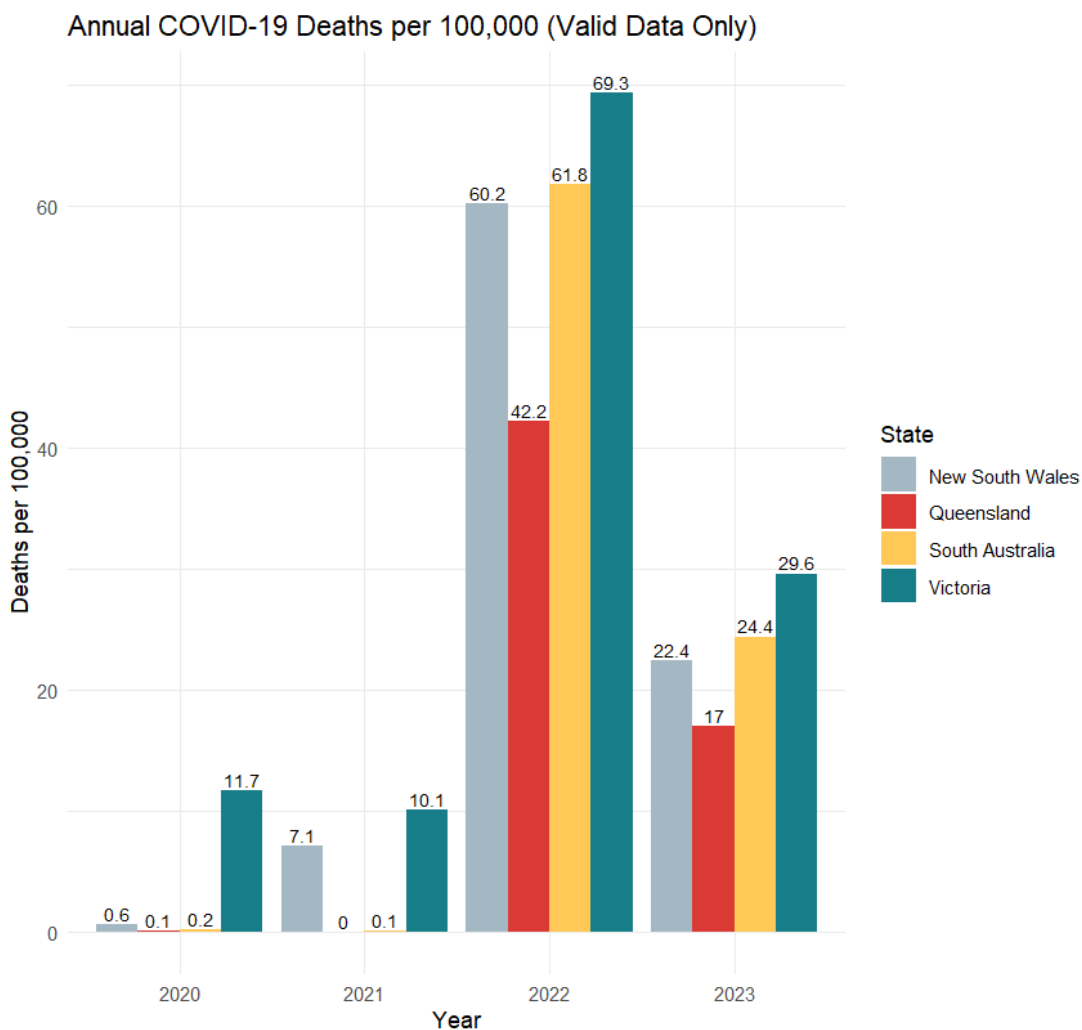

Graph 5: Yearly reported deaths per state

State	2020	2021	2022	2023
New South Wales	0.6	7.1	60.2	22.4
Queensland	0.1	0.0	42.2	17.0
South Australia	0.2	0.1	61.8	24.4
Victoria	11.7	10.1	69.3	29.6

Table 5: Yearly reported deaths per state

- The data has been analysed till october 2023 as the data after this date was not reiable enough to study. In 2022, all four states recorded their highest COVID-19 death rates, led by Victoria (69.3), South Australia (61.8), and New South Wales (60.2).

- In 2023, deaths dropped significantly: Victoria (29.6), SA (24.4), NSW (22.4), and QLD (17.0).

- 2020 and 2021 had very low fatalities, especially in Queensland (0.1, 0.0) and South Australia (0.2, 0.1). Victoria stood out for having relatively high early death rates: 11.7 in 2020 and 10.1 in 2021. Overall, deaths peaked in 2022 and declined in 2023 across all states.

3.2 Relationship Between Cases and Deaths
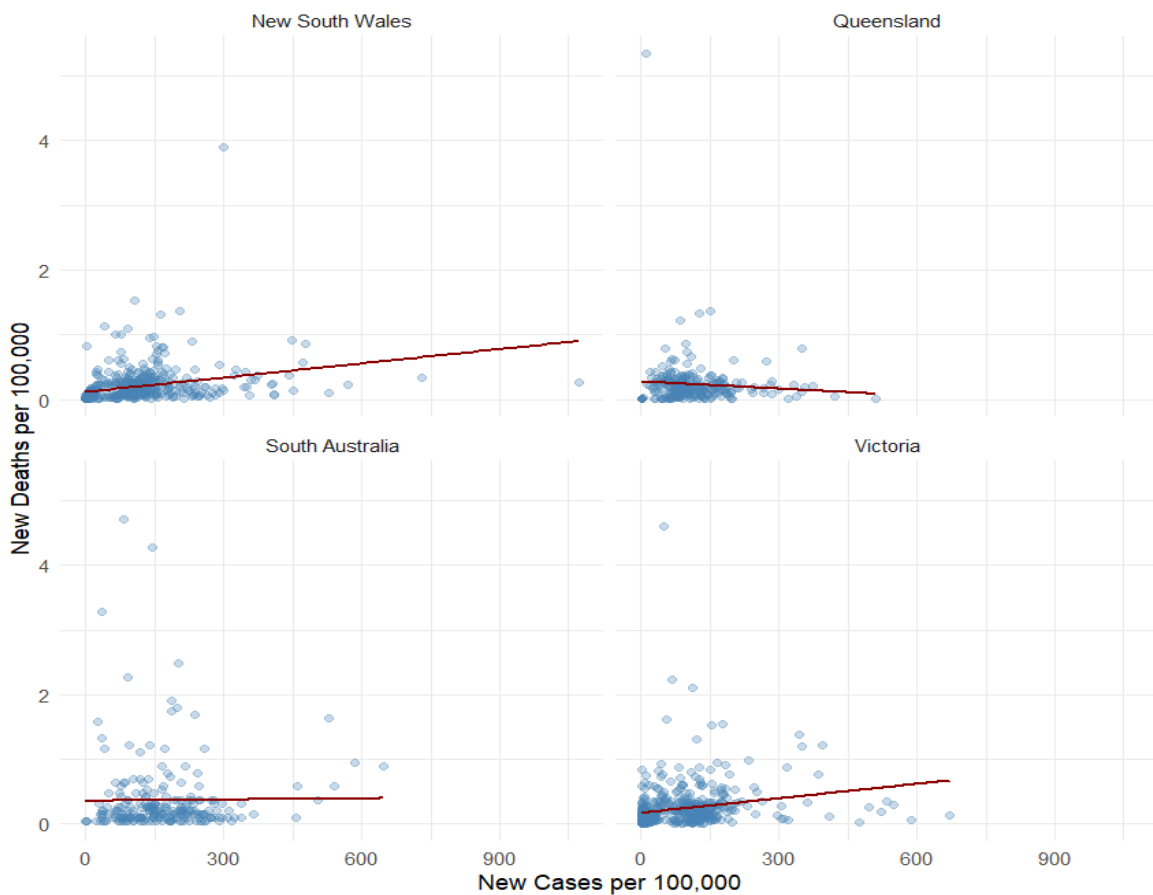
Graph 6: Relationship between cases vs reported death cases

State	Intercept	Slope	R-squared
New South Wales	7.64	0.00126	0.921
Queensland	4.41	0.00142	0.893
South Australia	6.29	0.00156	0.897
Victoria	14.80	0.00147	0.908

Table 6: Relationship between cases vs reported death cases

New South Wales

- When new cases are near zero, the model predicts ~7.64 deaths per 100,000. This represents the baseline death rate not explained by cases (possibly due to other reason).
- For every 100 new cases per 100,000, deaths are predicted to increase by about 0.13.
- The model explains 92.1% of the variation in deaths, indicating a strong relationship between new cases and deaths.

Queensland

- Even with zero new cases, the model predicts 4.41 deaths per 100,000.
- Each additional 100 cases is associated with an increase of 0.14 deaths per 100,000.
- The model's R^2 is 0.893, showing a very strong case–death association.

South Australia

- Baseline deaths are around 6.29 per 100,000 with no new cases.
- Each 100 new cases correspond to 0.16 additional deaths per 100,000.
- R^2 is 0.897, again indicating a strong predictive power of new cases on deaths.
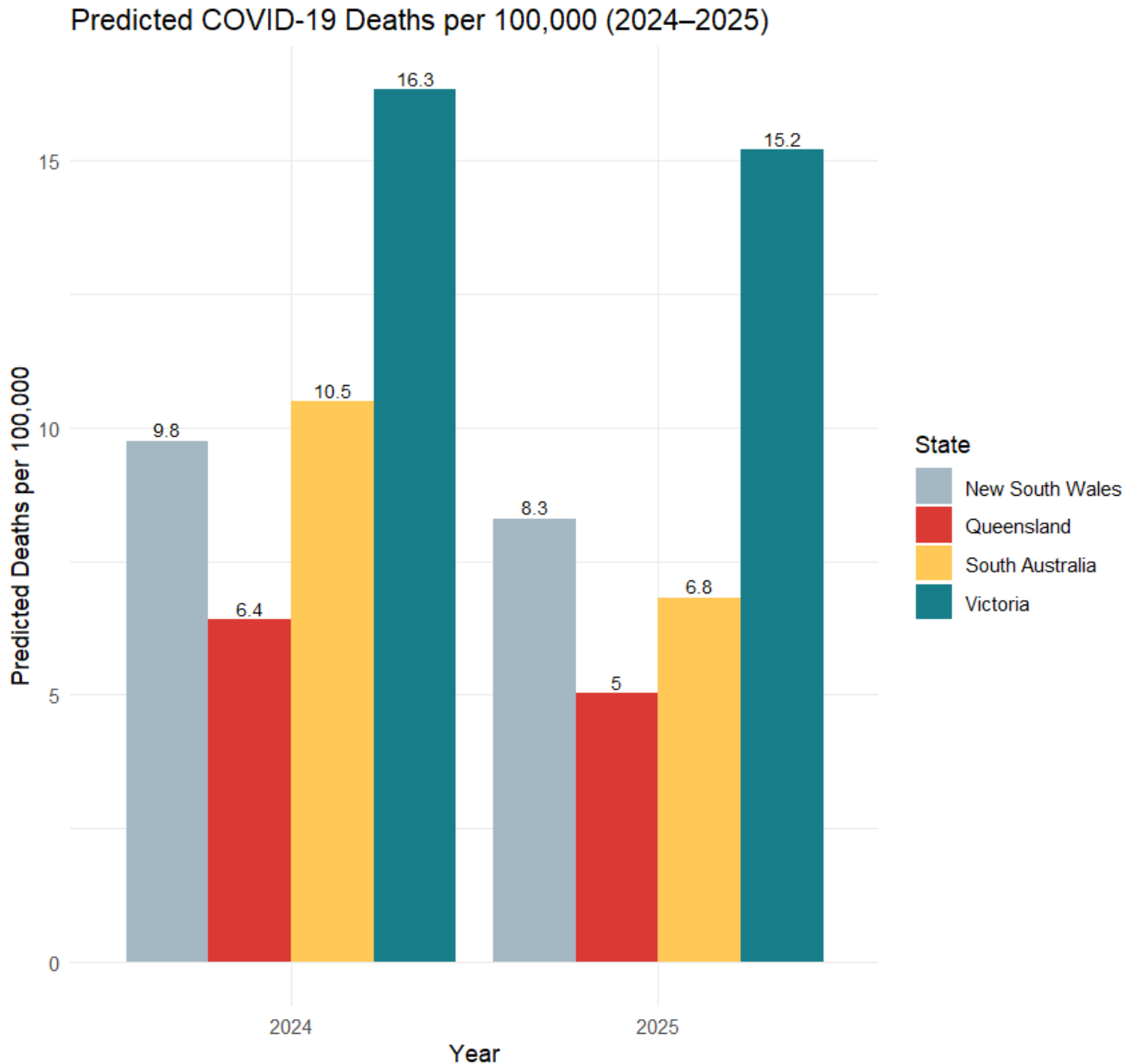
Victoria

- Starting deaths are predicted to be 14.80 per 100,000 without new cases, the highest baseline among all four states.
- For every 100 new cases, deaths increase by 0.15 per 100,000.
- The model explains 90.8% of the variation in deaths, showing a very strong fit.

All four models demonstrate very strong relationships between new COVID-19 cases and deaths. The R-squared values range from 0.893 to 0.921, which suggests that, in these states, new case numbers are highly predictive of death rates. Despite this, other variables (e.g., age demographics, comorbidities, healthcare response) may still refine predictions further in multivariate models.

3.3 Predicted Death Rates for 2024 and 2025

Predicted COVID-19 Deaths per 100,000 (2024–2025)

Graph 7: Predicted Death cases for 2024 and 2025

- **Victoria** continues to have the highest predicted death rate, with 16.3 deaths per 100,000 in 2024 and a slight decrease to 15.2 in 2025.
- **South Australia** sees a predicted drop from 10.5 to 6.8, showing a notable improvement but still relatively elevated.
- **New South Wales** predicts 9.8 deaths in 2024 and drops to 8.3 in 2025, reflecting a moderate decline.

- **Queensland** has the lowest predicted deaths, decreasing from 6.4 to 5.0, indicating consistent improvement or lower risk.

State	2024	2025
New South Wales	9.8	8.3
Queensland	6.4	5.0
South Australia	10.5	6.8
Victoria	16.3	15.2

Table 7: Predicted Death cases for 2024 and 2025

Overall declining trend in predicted deaths in 2025 across all four states. Victoria remains a hotspot despite the decline, while Queensland maintains relatively low predicted fatality. These values reflect model-driven predictions based on past relationships between cases and deaths. Actual outcomes could vary depending on public health interventions, vaccination coverage, and healthcare capacity.

4. Conclusion

The COVID-19 pandemic has had a profound and varying impact across Australia's major states. By analysing over five years of data (2020–2025), this report reveals several key insights into how the pandemic unfolded and its consequences:

- **Cumulative Case Burden:** South Australia recorded the highest total confirmed cases per 100,000 people (54,146), followed by New South Wales (50,630), Victoria (44,047), and Queensland (35,832). This suggests that despite having a smaller population, South Australia experienced a disproportionally large outbreak in relative terms.
- **Death Toll Over Time:** Victoria reported the highest cumulative deaths (140 per 100,000), showing that it was hit harder. In contrast, Queensland maintained the lowest death rate (65.9 per 100,000), suggesting better containment, demographics, or healthcare factors.
- **Recent Case Trends (2023–2025):** During the last 24 months, South Australia again stood out, recording the steepest increase in cases (from 125 to 6,398 per 100,000). New South Wales followed with a jump to 3,975, while Victoria and Queensland stayed below 3,300. This indicates that SA faced a major second wave or lingering outbreaks post-2023.

- **Monthly Case Variation:** South Australia also had the highest average monthly case rate (246 per 100,000) and the widest spread, indicating sporadic and intense waves. Victoria, on the other hand, showed the lowest average (93.3), reflecting more stable control.

- **Case–Death Relationship:** All states demonstrated strong linear relationships between new case rates and death rates. New South Wales showed the highest R^2 value (0.921), suggesting that 92.1% of the variation in deaths could be explained by the number of new cases. Victoria had the highest baseline death rate (14.8 per 100,000 even with no new cases), possibly reflecting compounding vulnerabilities.

- **Predictions for 2024–2025:** Models forecast declining death rates in 2025 across all states. Victoria is expected to remain the highest, with predicted rates of 16.3 in 2024 and 15.2 in 2025. In contrast, Queensland is projected to remain the lowest (6.4 and 5.0), reinforcing earlier trends.

While all states made progress in reducing deaths, Victoria and South Australia continue to bear higher per-capita impacts. Queensland appears the most resilient in terms of both case growth and fatality. The strong statistical correlation between case rates and deaths emphasizes the importance of early detection, containment, and prevention strategies. However, public health outcomes are clearly influenced by more than just case numbers with healthcare capacity, demographics, and vaccination likely playing pivotal roles.