

# COS30045 Data Visualization

## COVID-19 Health Impacts in Australia



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## **Executive Summary**

Our progress on creating an interactive platform for the COVID-19 Impact project is outlined in this process book. The steps of data collection and processing to initial design prototypes and implementing data visualizations in a web-based environment are documented in this book.

The website will use interactive data visualizations to present complex statistical data clearly to a broad audience, encompassing healthcare professionals, legislatives and citizens. We will utilize usability testing with a representative group of users completing various tasks to test the functionality of each visual presented. We believe that by observing this process, we can gain insight into the difficulties faced by users and identify potential areas for improvement in future iterations.

The process book represents both a documentation of our development process and a culmination of our skills, experience and data visualization knowledge developed while in this program.

# **1. Introduction**

## **1.1. Background and Motivation**

With the COVID-19 pandemic, there have also been notable influences on the healthcare system, the people, and the various strategies employed by the country's administration. Apart from the numbers, there have also been challenges, including the outcomes on the country's mortality rates, vaccination, and the overall impact on the various states and territories within the country.

The rationale for this project is to convert the complicated datasets relating to COVID-19 cases into interactive visuals, enabling users to explore the trends over time and compare the results across different regions. The project also aims to provide key information through interactive visuals, allowing different stakeholders, including students, policymakers, and the public, to understand the information better.

## **1.2. Visualisation Purpose**

The main objective of the visualisations provided on the website is to effectively communicate to its audience the ongoing effects of COVID-19 in Australia. By using complex data in visual representations, the audience can effectively interact with the data provided on the website, allowing them to comprehend the different factors that have been affected by the COVID-19 pandemic.

The website provides its audience with three different visualisation options. The Healthcare Expenditure Visualisation aims to educate its audience on the financial impacts of COVID-19 in Australia. This is achieved by displaying Australia's spending on healthcare over multiple years, allowing viewers to understand the differences between pre-pandemic spending and spending during the pandemic. The Fatality Rate Map provides its audience with geographical information about COVID-19-related deaths in Australia. This visualisation provides valuable insights into the severity of COVID-19 in different states in Australia. The Vaccination Progress Visualisation displays data on vaccinations

over time, allowing viewers to understand the effectiveness of vaccines in dealing with COVID-19.

The main objective of these visualisations is to educate its audience on different disparities in Australia's healthcare system. It aims to spark different discussions that can lead to improved health outcomes in Australia.

The main objective of these visualisations is to empower its audience with data-driven insights, allowing them to make different decisions that can lead to improved health outcomes in Australia.

## **2. Data**

### 2.1. Health spending

#### 2.1.1 Data Source

- Data source link:

<https://data-explorer.oecd.org/vis?tm=health%20spending&pg=0&hc>

[Measure]=Expenditure&snb=76&vw=tb&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD\_SHA%40DF\_SHA&df[ag]=OECD.ELS.HD&df[vs]=1.0&pd=2019%2C2022&dq=.A.EXP\_HEALTH.PT\_B1GQ.\_T.\_T.\_T...&to[TIME\_PERIOD]=false

- Data provider: OECD (the Organisation for Economic Cooperation and Development) hosts an online library, which provides a rich repository of statistics across numerous domains of both member and non-member countries. The data is retrieved from OECD Health Statistics. ‘Health expenditure and financing’ statistical data demonstrates how different countries finance their healthcare systems.

#### 2.1.2 Data Processing

##### Data download

The initial data format is downloaded in the .xls file. Using sorting functions in Microsoft Excel, the data is filtered to include only data from OCED member countries from 2019 to 2022. As the analysis focuses on how health spending is influenced by COVID-19, the period for visualisation only spans from 2019 until 2022. The given timeline is sufficient to define how health expenditure of countries, especially Australia changes as a response before, during and after the pandemic.

<b>Health expenditure and financing</b>						
Frequency of observation: Annual						
Measure: Expenditure						
<b>Time period</b>			<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
<b>Reference area</b>	<b>Combined unit of measure</b>					
Australia	Millions, Current prices		203,204.0	223,250.6	245,060.2	253,985.1
Austria	Millions, Current prices		42,045.0	43,405.4	49,500.2	50,289.7
Belgium	Millions, Current prices		52,059.6	53,157.6	57,123.9	60,541.2
Canada	Millions, Current prices		255,607.9	D 289,053.3	D 313,961.3	D 315,918.3
Chile	Millions, Current prices		18,203,386.8	19,516,658.9	23,282,220.0	26,320,506.2
Colombia	Millions, Current prices		83,046,238.5	86,842,140.2	109,024,700.6	111,660,378.9
Costa Rica	Millions, Current prices		2,731,953.8	2,855,920.0	3,069,382.3	3,219,010.2
Czechia	Millions, Current prices		440,931.6	522,797.7	577,424.9	597,168.6
Denmark	Millions, Current prices		234,618.2	248,768.0	273,588.7	269,465.4
Estonia	Millions, Current prices		1,892.7	2,081.6	2,351.6	2,527.8
Finland	Millions, Current prices					

Figure 1. OECD Health Expenditure Source Data

## **2.3. COVID-19 Death Cases**

### **2.3.1 Data Source**

The primary source of information for our project comes from the Australian Bureau of Statistics (ABS). The ABS is Australia's national statistical authority. Since 1905, it has been providing statistics and information that can be used for informed decisions by various stakeholders in Australia. The ABS provides high-quality and reliable statistics on various topics and domains, such as health statistics, population statistics, and economic conditions.

The relevant information for our project comes from the “COVID-19 Mortality in Australia: Deaths Registered until 31 January 2024” dataset. This dataset provides information about deaths that have been recorded in Australia due to COVID-19 from 2021 to 2024. This information is useful for our project as it allows us to visualize trends related to deaths due to COVID-19.

The information in our dataset is arranged in a tabular format and consists of various pieces of information. Some of these pieces of information include the state or territory where deaths have been recorded due to COVID-19, the year for which deaths have been recorded (i.e., 2021-2024), and the number of deaths recorded in each year and overall.

The visualization for our project is related to how deaths due to COVID-19 change from state to state over time. Therefore, we have included only the relevant information from our dataset for our visualization. All other information that is not relevant for our visualization has been left out. For example, information about age-standardized death rates is not included in our visualization.



### 2.3.2 Data Processing:

Here is the initial dataset before cleaning up and processing:

#### Deaths due to COVID-19: State of registration

- As of 31 January 2024, the most registered deaths due to COVID-19 had occurred in New South Wales (6,069) and Victoria (5,735). These states also have the highest age standardised death rates (SDRs) since the pandemic began, at 13.1 and 15.9 deaths per 100,000 population (rate for total pandemic period) respectively.
- In 2023, the highest SDR was in NSW (12.6). Queensland (10.6) recorded the lowest SDR.

#### COVID-19 deaths by state of registration, 2020-24

[Download](#)

	2020	2021	2022	2023	2024	Total
Number of deaths						
NSW	63	630	3,733	1,567	76	6,069
Vic	805	706	2,986	1,184	54	5,735
Qld	4	3	1,691	766	24	2,488
SA	4	3	845	371	9	1,232
WA	11	0	639	441	19	1,110
Tas	17	0	200	117	6	340
NT	0	1	52	15	1	69
ACT	2	12	155	64	0	233
Aus	906	1,355	10,301	4,525	189	17,276
Standardised death rates						
NSW	0.7	6.0	31.3	12.6	7.0	13.1
Vic	10.7	8.2	32.1	12.4	6.7	15.9
Qld	np	np	24.3	10.6	3.9	9.2
SA	np	np	27.7	11.7	np	10.3
WA	np	—	17.8	11.7	np	8.0
Tas	np	—	22.3	12.3	np	9.7
NT	—	np	37.2	np	np	12.3
ACT	np	np	30.7	12.4	—	12.0
Aus	3.1	4.1	28.3	12.0	5.8	12.2

Figure 6. Australia's Raw Mortality Dataset

## Data Cleanup and Processing Steps

### 1. Data Collection:

- To access the Australian Bureau of Statistics website and find the “COVID-19 Mortality in Australia: Deaths Registered until 31 January 2024” dataset.
- First download the dataset as a CSV file.

### 2. Initial Data Format:

- The dataset is initially presented as shown in the image:

	2020	2021	2022	2023	2024	Total
<b>COVID-19 deaths by state of registration, 2020-24</b>						
Number of deaths						
NSW	63	630	3,733	1,567	76	6,069
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WA	110		639	441	19	1,110
Tas	170		200	117	6	340
NT	0		1	52	15	69
ACT	2	12	155	640		233
Aus	906	1,355	10,301	4,525	189	17,276
<b>Standardised death rates</b>						
NSW	0.7	6.0	31.3	12.6	7.0	13.1
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Qld	np	np	24.3	10.6	3.9	9.2
SA	np	np	27.7	11.7	np	10.3
WA	np	—	17.8	11.7	np	8.0
Tas	np	—	22.3	12.3	np	9.7
NT	—	np	37.2	np	np	12.3
ACT	np	np	30.7	12.4	—	12.0
Aus	3.1	4.1	28.3	12.0	5.8	12.2

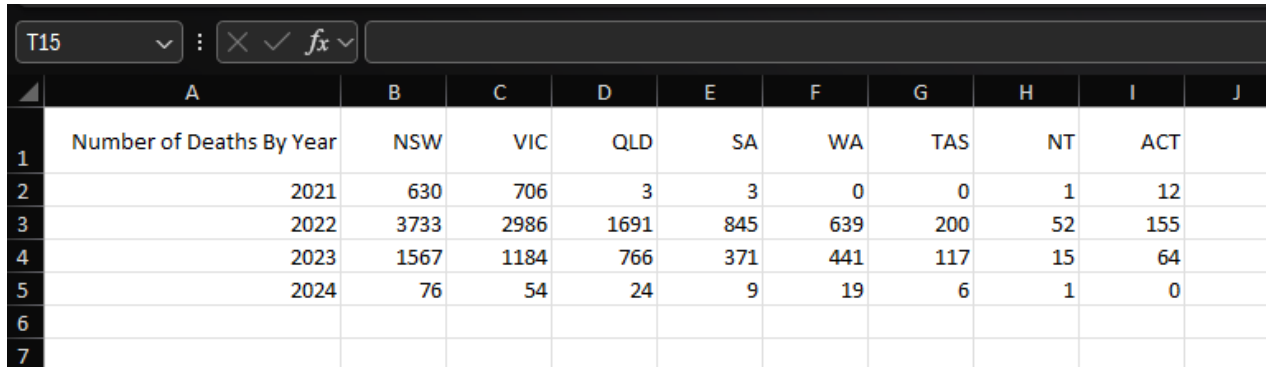
a. Includes COVID-19 death registrations only. Numbers will differ to disease surveillance systems.  
b. Includes all COVID-19 deaths (both doctor and coroner certified) that occurred and were registered by 31 January 2024.  
c. All deaths due to COVID-19 in this report have been coded to ICD-10 code U07.1 COVID-19, virus identified; U07.2 COVID-19, virus not identified as the underlying cause of death; or U10.9 Multisystem inflammatory syndrome associated with COVID-19.  
d. Data is provisional and subject to change.  
e. Refer to the methodology for more information regarding the data in this graph.  
f. Standardised death rates have been annualised.

Source: Australian Bureau of Statistics, COVID-19 Mortality in Australia: Deaths registered until 31 January 2024 27/02/2024

Figure 7. Raw Mortality Dataset (view in Microsoft Excel)

### 3. Removing Unnecessary Data:

- Data from 2020 is excluded since the data is based on the 2021-2024 period, and columns related to standardized death rates are excluded since they are not required for this visualization.



The screenshot shows a spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J
1	Number of Deaths By Year	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	
2	2021	630	706	3	3	0	0	1	12	
3	2022	3733	2986	1691	845	639	200	52	155	
4	2023	1567	1184	766	371	441	117	15	64	
5	2024	76	54	24	9	19	6	1	0	
6										
7										

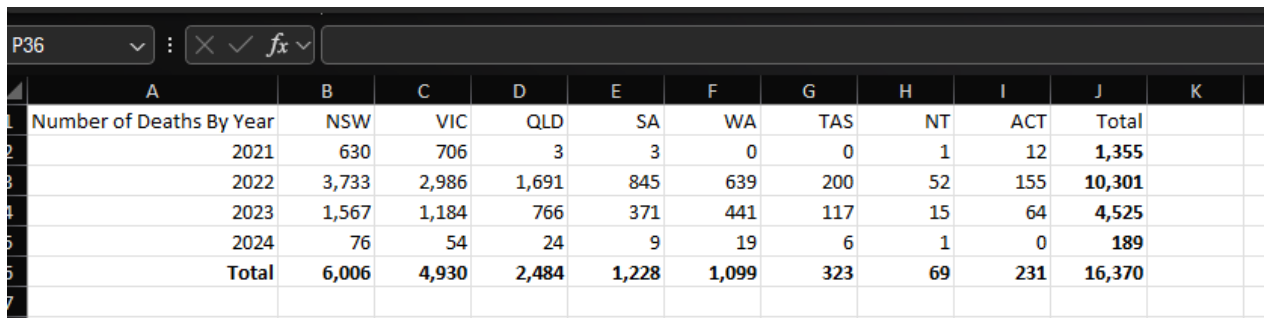
Figure 8. Refined Australian Mortality Dataset

#### 4. Calculating Totals for Australia:

- We used the SUM formula to determine the total deaths in Australia for the years 2021 to 2024. The same formula was used to determine the total deaths in Australia for each state, and this was achieved using the fill tool to complete the remaining cells in the column.

#### Final Processed Dataset

After processing, the final dataset is displayed as follows:



The screenshot shows a spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J	K
1	Number of Deaths By Year	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total	
2	2021	630	706	3	3	0	0	1	12	1,355	
3	2022	3,733	2,986	1,691	845	639	200	52	155	10,301	
4	2023	1,567	1,184	766	371	441	117	15	64	4,525	
5	2024	76	54	24	9	19	6	1	0	189	
6	Total	6,006	4,930	2,484	1,228	1,099	323	69	231	16,370	
7											

Figure 11. Final Mortality Dataset

The above process of data management helps ensure that the visualizations are accurate and informative, thus helping users to better comprehend the effects of COVID-19 in Australia and the success of the vaccines.