

Swinburne University of Technology



COS30045 – DATA VISUALISATION

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Data Visualisation Critique Report

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Acknowledgement of Country

I, Serena Truong, respectfully acknowledge the Wurundjeri People of the Kulin Nation, who are the Traditional Owners of the land on which Swinburne's Australian campuses are located in Melbourne's east and outer-east, and I pay our respect to their Elders past, present, and emerging. We are honored to recognise our connection to Wurundjeri Country, history, culture, and spirituality through these locations, and strive to ensure that we operate in a manner that respects and honors the Elders and Ancestors of these lands.

Introduction

The dashboard presents the statistics on mobile phone which related traffic enforcement in Australia. Its purpose is used to track and visualise trends in fines for mobile phone use while driving across different jurisdictions, detection methods and time methods conducted throughout the Australian states and territory between 2008 and 2023. Furthermore, it is also used to inform policymakers, law enforcement, and the public about trends in mobile phone use enforcement and compliance. Moreover, it displays different annual fines for mobile phone use, jurisdiction breakdowns by using Line chart visualisations. Then, it further highlights enforcement methods (compare between police and camera) and fines per 10,000 licenses using bar chart. In addition to displaying data on mobile phone-related driving violations, this dashboard aims to raise public awareness about the risks associated with distracted driving, especially mobile phone use. It also documents the methods used to detect and penalise offenders. Finally, the dashboard can be seen as an educational resource and a tool for assessing the effectiveness of enforcement strategies and policy implementation.

Intended audiences

The young drivers and students: According to “The Medical Journal of Australia”, those Aged 17-25, exhibit rates of mobile phone use while driving compared to older age groups. This increasing usage is associated with a greater rate of collisions and near-misses among this population. It emphasizes the need for targeted interventions aimed at younger drivers to mitigate the risks associated with mobile phone use while driving. Questions they might ask: “Which states issue the most fines for mobile phone use?”, “Are camera-detected fines replacing police-issued fines?”

Government officials and policy makers in road safety: Policymakers and law enforcement need accurate data to evaluate enforcement methods like mobile phone detection cameras and shape safety strategies. Their focus is on outcomes, asking questions like “Are cameras effective?” or “Do all states use the same tech?”.

The public: Benefits by gaining awareness of penalties and risks, with questions such as “How many fines are issued in my state?” or “Is phone use while driving increasing?” The dashboard supports both analysis and public education.

Transport safety analyst: They study behavioural patterns and risk factors related to road safety. This dashboard provides them with valuable insights into trends in mobile phone-related enforcement, allowing them to investigate questions such as, “Are mobile phone offences increasing in certain states?” or “What enforcement methods are linked to lower offence rates?”

Hence, this dashboard can help users to understand their questions because it supports public awareness, education, and informed decision-making.

Data Processing and Governance

The dataset is provided by the Australian Government source, most likely state and territory law enforcement agencies reporting to the Department of Infrastructure, Transport, Regional Development, Communications and the Arts. It is likely compiled from law enforcement and traffic surveillance systems such as camera and police reports, annual fines for mobile phone use while driving (from 2008-2023). So, there are various concerns about data quality, privacy, and bias

Data Governance, Quality, Privacy, Bias

Inconsistency issues: Missing camera data from some jurisdictions. No indication of how consistently jurisdictions report fines or update the data. The time series data appears to have different starting points for each jurisdiction, especially in the "Annual fines by jurisdiction" graphic. This shows that historical data gathering techniques vary among states and territories, making long-term trend research possibly untrustworthy. This inconsistency results in an unorganised dataset where comparisons between jurisdictions possibly deceptive. For instance, NSW shows higher numbers than jurisdictions, but this could reflect more extensive reporting rather than just enforcement differences.

Privacy issue: No privacy risks are evident as data is anonymised and no personal information is contained. In the dataset, there are columns such as Location and Age, but they do not contain personally identifiable details. Therefore, it does not breach data protection regulations as data is aggregated and anonymised.

Bias: Enforcement discrepancies such as some states using cameras while others rely on police create systemic bias. For example, NSW's heavy camera uses potentially skewing national totals whereas South Australia relies on police only. Since the data reflects enforcement actions rather than actual behaviour, regions with more resources may appear to have higher violations regardless of true mobile phone use. Then, camera and police detection methods are likely to target different places and demographic groupings. Therefore, without clarity regarding distribution techniques, the data may contain hidden selection biases that overrepresent specific groups or driving situations.



Figure 1: Lack of Camera-based data in South Australia (2021)

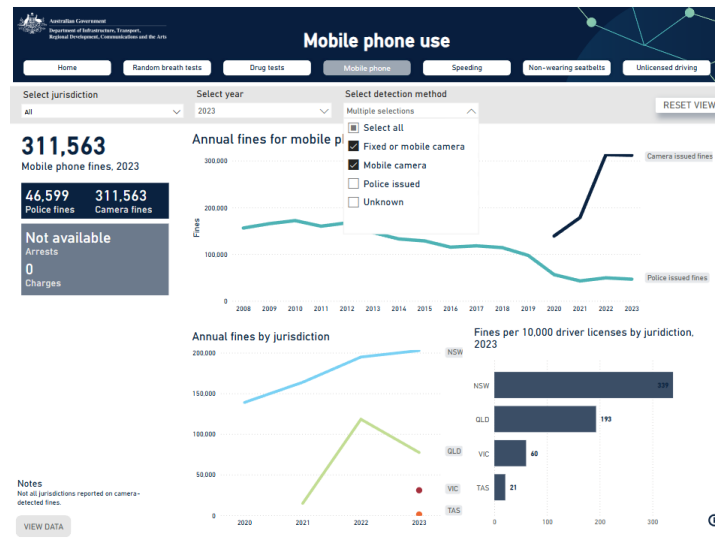


Figure 2: Filtered charts are shown by detection methods



Figure 3: Lack of Camera-based data in South Australia (2022)

Additionally, the lack of camera-based data reporting in some states (or incomplete data in specific years like 2021–2022) such as South Australia or Western Australia can skew national comparisons or only 4 states like NSW, QLD, VIC, TAS are presented when filtered “Camera issued fines”. Presenting charts without clearly annotating missing or incomplete data could be misleading, violating ethical standards of data representation. According to Biotext (2023), ethical data visualisation requires full transparency about limitations and assumptions something this dashboard does not fully achieve.

Data Processing

Firstly, before creating the visualisations, the provided dataset was prepared and cleaned. The dataset needs to be filtered to focus solely on violations involving mobile phone use. It is also important to thoroughly assess and address any missing data, as reporting may be incomplete in certain regions. For example, as shown in the dataset below, these fields consistently contain null or unreported entries across various locations in Victoria (VIC), including Inner Regional, Major Cities, and Outer Regional areas. This lack of data suggests incomplete reporting or

potential limitations in data collection from law enforcement sources. To maintain data integrity, these missing values should be flagged and either excluded from certain analyses or supplemented with additional information if available.

<input type="checkbox"/>	#	RowID	JURISDICT... String	LOCATION String	FINES Number (double)	ARRESTS Number (double)	CHARGES Number (double)
<input type="checkbox"/>	1343	Row13	VIC	Inner Regional Austr	26	?	?
<input type="checkbox"/>	1344	Row13	VIC	Inner Regional Austr	66	?	?
<input type="checkbox"/>	1345	Row13	VIC	Inner Regional Austr	49	?	?
<input type="checkbox"/>	1346	Row13	VIC	Inner Regional Austr	19	?	?
<input type="checkbox"/>	1347	Row13	VIC	Inner Regional Austr	242	?	?
<input type="checkbox"/>	1348	Row13	VIC	Major Cities of Austr	53	?	?
<input type="checkbox"/>	1349	Row13	VIC	Major Cities of Austr	154	?	?
<input type="checkbox"/>	1350	Row13	VIC	Major Cities of Austr	118	?	?
<input type="checkbox"/>	1351	Row13	VIC	Major Cities of Austr	24	?	?
<input type="checkbox"/>	1352	Row13	VIC	Major Cities of Austr	2,466	?	?
<input type="checkbox"/>	1353	Row13	VIC	Outer Regional Austr	5	?	?
<input type="checkbox"/>	1354	Row13	VIC	Outer Regional Austr	11	?	?
<input type="checkbox"/>	1355	Row13	VIC	Outer Regional Austr	14	?	?
<input type="checkbox"/>	1356	Row13	VIC	Outer Regional Austr	4	?	?
<input type="checkbox"/>	1357	Row13	VIC	Outer Regional Austr	9	?	?
<input type="checkbox"/>	1358	Row13	VIC	Unknown	1	?	?
<input type="checkbox"/>	1359	Row13	VIC	Unknown	3	?	?

Figure 4: Missing values are left empty in the data table

Secondly, a key modification to the data involved calculating fines per 10,000 driver licenses, allowing for fairer comparisons across states by accounting for population differences. Additionally, the data was sorted or organised by year and region, then transformed into a long format to improve compatibility with visualisation tools such as KNIME or Tableau/Tableau Prep Builder platform.

Finally, to effectively illustrate the annual fines for mobile phone use, KNIME can be used to clean, transform and visualise data through a structured workflow. First of all, import the dataset using CSV Reader node. Use the Row Filter to keep only mobile phone-related violations. Handle missing data with the Missing Value node, then aggregate fines by year using the GroupBy node. Then, visualise the trends using the Line Plot or Bar Chart node. This workflow ensures clean, focused data and clear visual representation.

Visualisation Design and Interactive

While the visuals are generally clear and adhere to design principles, there are still room for improvement to enhance clarity, usability, and interactivity. To support an analysis of how data is mapped to visual elements in the dashboard on mobile phone use while driving, several authoritative guidelines on effective data visualisation can be referenced.

1. Annual fines for mobile phone use

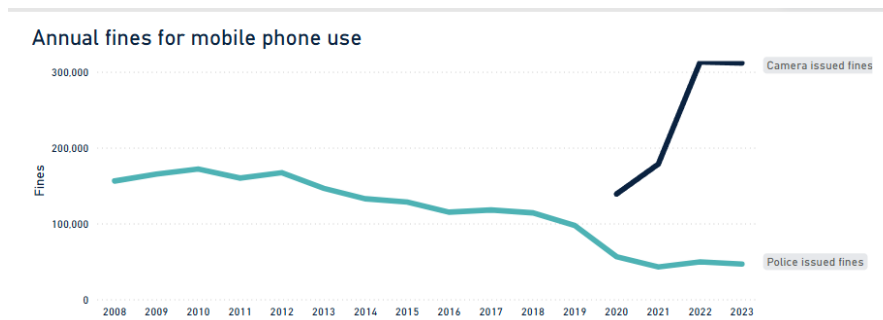


Figure 5: Annual fines for mobile phone use

This line chart presents annual fines over time, with separate lines for police-issued and camera-detected fines. The x-axis represents time (years) and the y-axis represents the number of fines. The use of various line styles or colors effectively distinguishes enforcement methods.

The chart maintains recognised design standards by employing a common line chart to represent trends over time. However, the lack of annotations for major events such as the implementation of camera enforcement may limit the user's understanding of unexpected changes in trends. Annotations, according to the CEIH Data Visualisation Style and Best Practice Guide, may add valuable context to data visualisations.

“Use contrasting colour for multiple lines” are used to differentiate enforcement methods and to “highlight important data” like blue and black (CEIH, 2023), but ensuring sufficient contrast is crucial for accessibility. Labels are appropriately placed, aiding in comprehension. The chart type is suitable for illustrating trends over time.

2. Annual fines by Jurisdiction

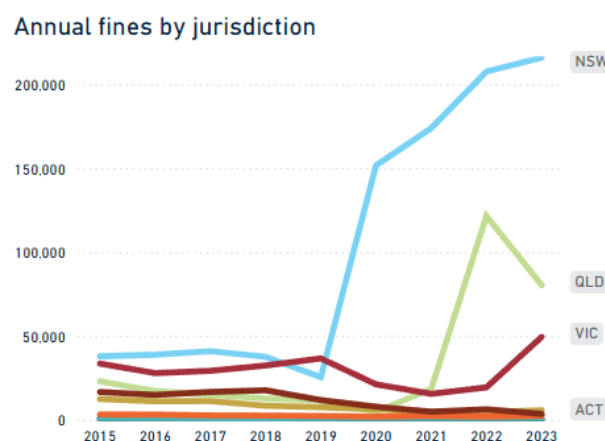


Figure 6: Line chart of Annual fines by Jurisdiction

Jurisdiction-level data is visualised through a multi-line trend chart. Filters are available at the top for jurisdiction, year, and detection method. This multi-line chart compares annual fines across different jurisdictions. Each line represents a state or territory, with interval variable-time (year) on the x-axis and the number of fines on the y-axis. Colour coding distinguishes between jurisdictions. The time range begins from 2015 and continues to 2023, which differs from Chart 1, where annual fines are shown from 2008 to 2023. This inconsistency is most likely due to data availability at the jurisdictional level, since certain states or territories may not have submitted mobile phone fine statistics before 2015.

While the chart effectively shows trends across jurisdictions, overlapping lines can create clutter, especially when many jurisdictions are presented at the same time. According to European data recommendations, implementing interactive elements to isolate certain jurisdictions might help reduce this issue.

Distinct colours for each jurisdiction help with distinctiveness, but they must be clearly recognised. To retain readability, labels should be legible, and the chart should be kept to a reasonable size.

Interactive elements, such as the option to choose or deselect jurisdictions, and hover over information, can help users explore and comprehend the data.

3. Fines per 10,000 driver licenses by jurisdictions, 2023

Fines per 10,000 driver licenses by jurisdiction, 2023

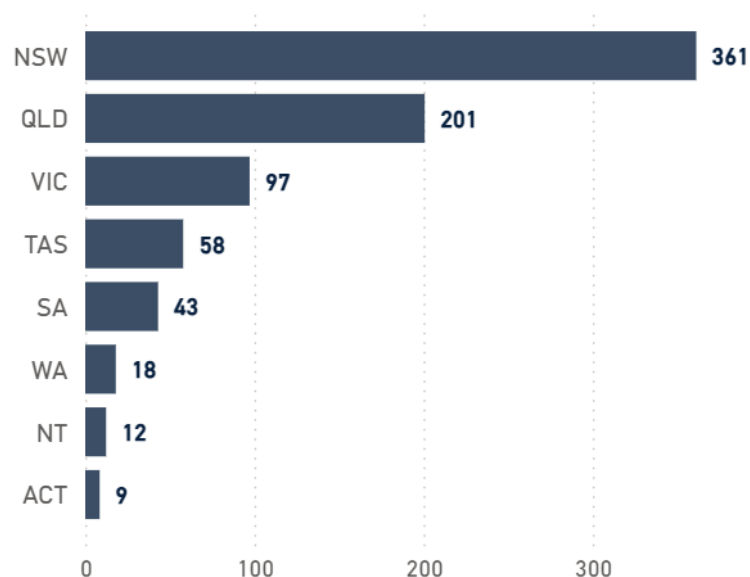


Figure 7: Fines per 10,000 driver licenses by jurisdictions, 2023

This horizontal bar chart normalises fines by the number of driver licenses, allowing for fair comparison across jurisdictions. Jurisdictions are listed on the y-axis, with fines per 10,000 licenses on the x-axis.

Design evaluation involves normalising data to adjust for population size differences and improve comparability. The horizontal bar chart is ideal for category comparison and follows CEIH's guideline to use common chart styles. As a result, using this normalised technique, readers may easily compare the prevalence of mobile phone penalties among states, independent of population size.

Consistent color usage and clear labelling improve reading, the styling of text is easy to read. Including data values at the end of bars can provide immediate insight without the need for user engagement.

Using sorting options (e.g., ascending or descending order) and filters for enforcement techniques can provide users with deeper insights into the data. Besides that, there is a grammar issue in the title: "jurisdiction" is spelled as "juridiction". To ensure the title is relevant, eliminate grammar problems.

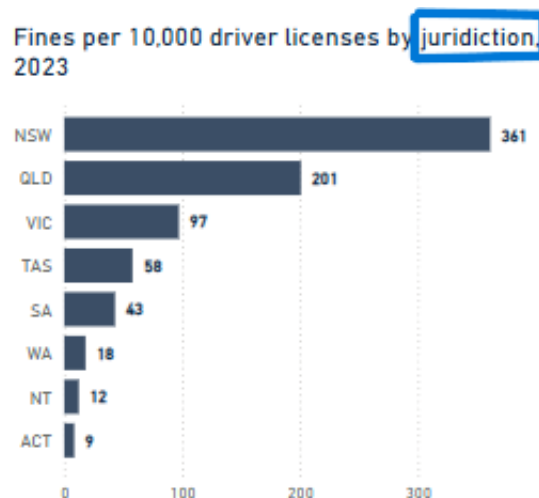


Figure 8: Grammar mistake of the word 'jurisdiction'

4. Fines Summary

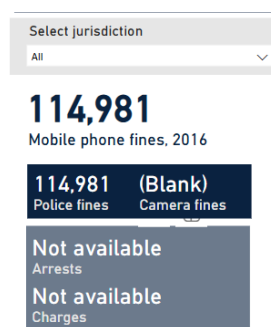


Figure 9: Fines summary

This section summarises total fines of mobile phone use in 2016, separating between police-issued and camera-detected fines, arrests, and charges which makes the data clear to view and structured. The data is most frequently shown via numerical indicators or simple charts. As the figure is shown above, if there is no data to display, it is presented as “Blank” and “Not available”. Additionally, it ensures that colours are used consistently across the dashboard maintains visual coherence.

List of interactives

There are list of interactives are displayed in the PowerBI dashboard. Many benefit features are meant to be used on this dashboard, allowing customers to keep track the information, charts and experience user-friendly interface. One thing of these functions that needs to be improved is that the tooltip is hidden and it is shown quite slowly when hovered over.



Figure 10: Filters and focus mode are displayed when the mouse-clicked

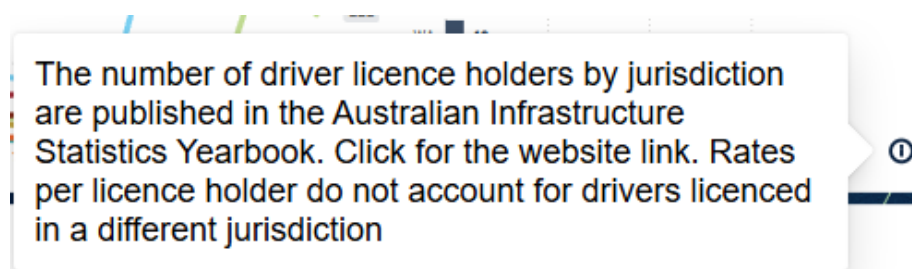


Figure 11: The tooltip about the number of driver licences holders by jurisdiction

Jurisdiction	NSW
Fines per 10,000 licence holders	361.20
Fines	216,042
Licences	5,981,229

Figure 12: Hover tooltip when the mouse-clicked

Select jurisdiction

Victoria

Select year

2022

Select detection method

All

RESET VIEW

Figure 13: Navigation bar or filter bar buttons

300,000

Filters and slicers affecting this visual

METRIC
is mobile_phone_use

Year
is 2023

Figure 14: Filters affect the chart

Recommendations

To address technical limitation, improving the tooltip functionality is suggested. Some tooltips are slow to load and difficult to interact with. Enhancing their responsiveness and ease of use would allow users to access extra information more efficiently and enhance the overall user experience. In addition, to improve the accuracy and clarity of the dashboard, it is recommended to include annotations that explain major changes in enforcement methods like the introduction of camera detection in specific states. Implement clear data quality indicators including completeness ratings for each jurisdiction. Finally, integrating interactive components

like as tooltips or filters for state-level analysis can boost user engagement and support more detailed exploration of the data.

AI Declaration

I used generative AI tools like ChatGPT, Gemini to help restructure my report and refine my paragraphs to meet the word count requirement. All analysis, critical evaluation, and reasoning are based on my own.

References:

McEvoy, S. P., Stevenson, M. R., & Woodward, M. (2006). *Phone use and crashes while driving: A representative survey of drivers in two Australian states*. Medical Journal of Australia, 185(11), 630–634. <https://www.mja.com.au/journal/2006/185/11/phone-use-and-crashes-while-driving-representative-survey-drivers-two>

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