

# Australian Police Drug Testing Dashboard Design Book

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# 1 Introduction and Purpose

The BITRE drug driving enforcement dataset provides a national view of roadside drug-testing outcomes. This design book documents the processing, interactive visualisation, and validation work for the COS30045 project. The audience includes transport safety policymakers, law enforcement leaders, and public health analysts who need clear evidence of temporal, jurisdictional, and demographic risk patterns. The goal is to translate complex enforcement data into interactive and static visuals that guide decision-making, support transparency, and remain reproducible for assessment.

## 2 Data

### 2.1 Source and Governance

Primary data: BITRE National Road Safety Data Hub. File used: `processed_police_data.json` (cleaned positive-test subset). Records: 7,856 positive-test entries spanning 2008–2024, totaling 576,929 positive results. Peak concentration: NSW in 2023 with 40,551 positives (47.1% of that year). Drug totals (all years): amphetamine 82,550; cannabis 64,859; cocaine 9,570; methylamphetamine 6,352; ecstasy 2,291. Data are aggregated and free of personal identifiers; governance follows BITRE open-data terms with annual provenance per jurisdiction.

### 2.2 Processing Overview

KNIME workflow steps: Excel Reader ingests the source spreadsheet; Column Filter retains relevant fields; Row Filters drop “no drugs detected” rows and non-target metrics; Category to Number converts drug flags to binary; GroupBy aggregates by year, jurisdiction, age group, and drug flags; CSV Writer exports the cleaned dataset for the D3 dashboard. Quality checks include range validation, categorical consistency, and removal of unknown markers.



*KNIME pipeline converting the source Excel into aggregated, binary-coded positives for the dashboard.*

### 3 Exploratory Data Analysis

Key findings: total positives rise from 2,413 in 2008 to 87,930 in 2024, a 25.2% compound annual growth rate. Annual totals span an interquartile range of 8,242 to 48,216 with a median of 38,703; 2024 is the highest year. NSW 2023 represents the largest single jurisdictional share (47.1% of that year). Amphetamine detections lead the substance mix, followed by cannabis and a smaller but notable cocaine signal. Jurisdictions such as WA and QLD show high absolute counts in recent years. Figures 1, 2, and 3 provide static snapshots for citation alongside the interactive dashboard.

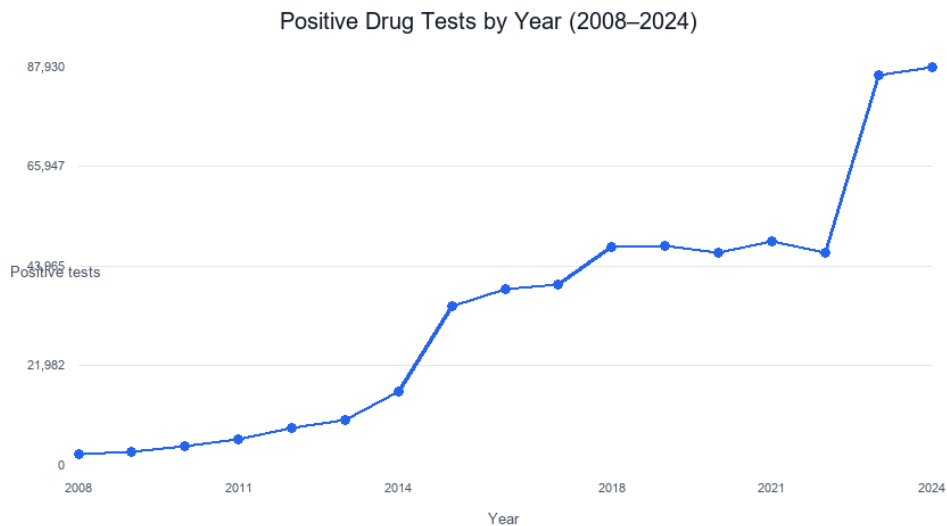


Figure 1: Temporal trend of positive drug tests, 2008–2024.

## 4 Visualisation Design

### 4.1 Layout and Typography

A light-mode layout with Atkinson Hyperlegible typography supports on-screen readability. Sectional navigation follows the research questions, guiding users from temporal trends to jurisdictional comparison, age cohorts, substance mix, and composition across age groups. Colour usage emphasises contrast for accessibility; legends and labels are consistent across views.

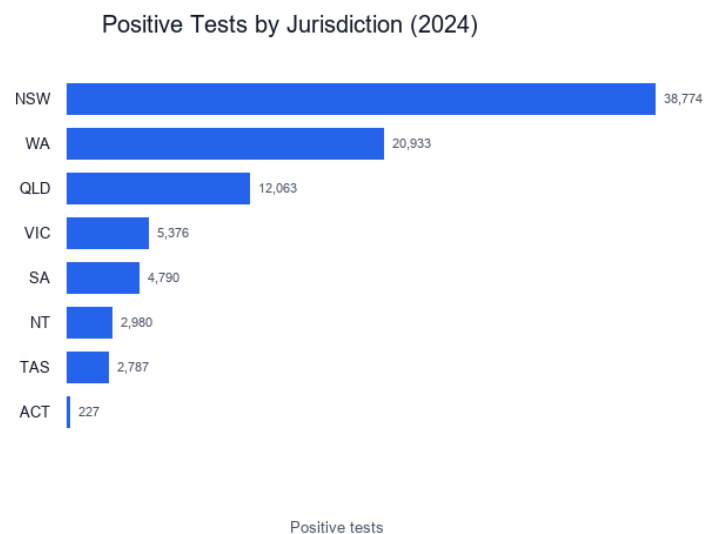


Figure 2: Jurisdictional comparison of positive tests in 2024.

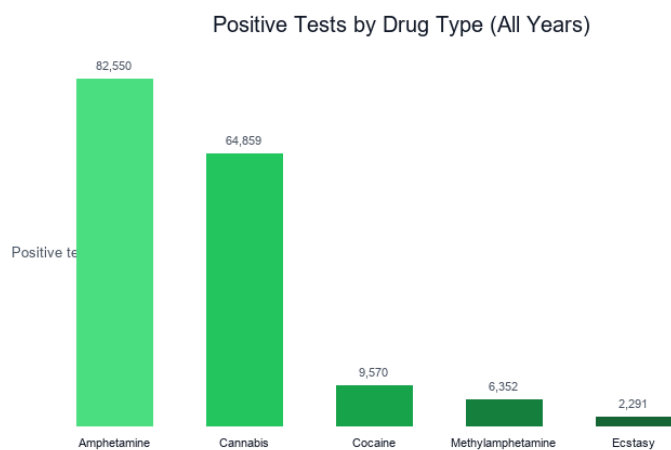


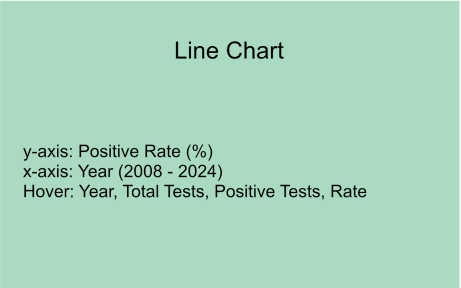
Figure 3: Positive tests by drug type across all years.



## Positive Drug Rate Over Time

Filters: Drug type dropdown

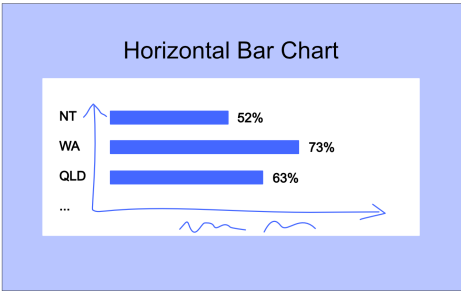
Jurisdiction dropdown



Insight Box: Key trend summary

## Positive Drug Rates by Jurisdiction

Filters: Year dropdown

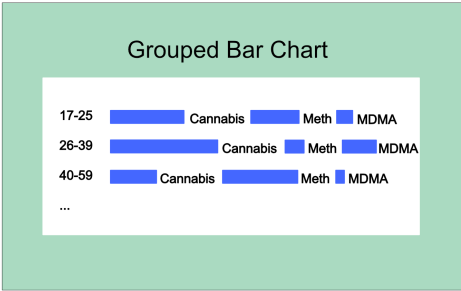


Small Australia Map (Static SVG)

## Positive Rate by Age Group

Filters: Drug Type dropdown

Year Selector



Tooltip: Age group + Drug type + Positive rate

*Wireframe guiding the final light-mode layout and content flow.*

## **4.2 Design System Notes**

Colour palette uses neutral backgrounds with blue accents for primary marks and green variants for drug-type bars. Spacing follows an 8px rhythm to maintain alignment. Accessibility considerations include sufficient contrast, keyboard-focusable controls, touch targets sized for mobile, and legend/text redundancy for colour-only encodings.

# **5 Implementation and Interactivity**

The D3-based dashboard renders multiple coordinated charts with dropdown filters for jurisdiction, year, age group, and substance. Runtime rollups operate on the cleaned JSON, keeping interactions fluid for the 7,856-row dataset. Tooltips expose precise counts and shares; charts resize on viewport changes to preserve readability on desktop and mobile. Performance is kept high by limiting redraws to filter changes and using lightweight scales and transitions.

## **5.1 Coding Practice and Performance**

Code is modular by chart, avoids blocking operations, and keeps the dataset in memory for rapid filtering. Axis labels, legends, and consistent colour mappings maintain readability. Responsive sizing adapts SVG dimensions on resize events; transitions are lightweight to avoid jank.

## **5.2 Complexity and Annotations**

The solution integrates multiple dimensions (time, jurisdiction, age, drug type) across coordinated views, with composition analysis in the stacked chart and explicit peak metrics in the summary. Static figures provide traceable, citable evidence alongside interactivity.

## **5.3 Interactivity and Responsive Design**

Dropdowns, hover tooltips, and redraw-on-resize support exploration on desktop and mobile. Touch targets and focusable controls follow accessibility guidance; legends and text redundancies reduce reliance on colour alone. Charts remain legible at narrow widths by adjusting margins and label density.

## **5.4 Storytelling and Guidance**

Narrative flow runs from temporal change to jurisdictional comparison, cohort examination, substance mix, and age-by-drug composition. Intro text and captions direct users to compare peaks, outliers, and dominant substances while tracking data provenance and scope.



## 6 Iteration and Validation

Weekly iterations incorporated tutor and peer feedback: strengthened colour contrast and axis labelling; clarified filter controls; streamlined navigation; added accessibility improvements (focus order, touch targets, legend consistency). Usability checks targeted task completion under one minute for comparison tasks and verified tooltip readability without overlap.

## 7 Conclusion and Future Improvements

The work surfaces temporal growth in positive drug tests, jurisdictional concentration (notably NSW in 2023), and a substance mix led by amphetamine and cannabis. The visual system balances readability and responsiveness while maintaining governance and data integrity. Future work: add real-time data refresh, integrate crash severity linkages, and extend multilingual support.

## References

[R1] Australian Government Bureau of Infrastructure, Transport and Regional Economics. (2024). National Road Safety Data Hub. <https://roadsafety.transport.gov.au/>

## AI Declaration

ChatGPT was used to draft and refine text, summarise exploratory findings, and format LaTeX. All quantitative results derive from the project datasets and code; references are real and verifiable. Tooling includes D3.js for visualisation, KNIME for preprocessing, and XeLaTeX for document compilation.