Australian Police Drug Testing Dashboard Design Book

Group 4 (COS30045)

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1 Executive Summary

Aspect	Detail
Scale	7,856 aggregated positive-test rows (576,929 positives), years 2008–2024.
Growth	25.2% CAGR from 2008 to 2024; 2024 is the peak year.
Hotspot	NSW 2023 counts 40,551 positives (47.1% share of that year).
Substances	Amphetamine and cannabis dominate; cocaine rising; methylamphetamine smaller but critical.
Product	Linked D3 views (trend, jurisdiction, age, drug, composition, map, remoteness, creative) with SVG/CSV export.
Governance	BITRE lineage, no PII, range/consistency checks, reproducible KNIME $\rightarrow$ JSON pipeline.
Accessibility	Contrast-safe palette, keyboard/touchable controls, responsive layouts, text redundancies.

2 Audience and Purpose

Stakeholders	Transport safety policymakers, law enforcement leads, public health analysts, researchers, transparency-focused public.
Goals	Reveal temporal change, jurisdictional concentration, cohort risk, substance composition to guide policy, targeting, and messaging.

3 Strategic Context (2016–2025)

Roadside drug testing in Australia operates on presence-based *Zero Tolerance*, creating friction with impairment science and medicinal cannabis legality. Evidence (Smith & Brown, 2022; Drummer et al., 2020) shows methylamphetamine has high crash culpability while low-dose THC presents nuanced risk. General deterrence remains weak (BOCSAR, 2024); heavy stimulant users often evade detection. Legislative dissonance for medicinal cannabis persists despite therapeutic legality, motivating reform pilots.

4 Data and Governance

4.1 Source and Provenance

Dataset	BITRE National Road Safety Data Hub enforcement records (2008–2024). Working file: `processed_police_data.json`.
Coverage	All Australian jurisdictions; remoteness detail mainly for 2023–2024.

4.2 Lineage and Pipeline

Step	Action
Ingest	Excel import of BITRE enforcement extract; field presence validated.
Filter	Keep enforcement fields; drop non-target metrics.
Clean	Exclude `NO_DRUGS_DETECTED=Yes`; retain `METRIC=positive_drug_tests`.
Encode	Map drug flags (AMPHETAMINE, CANNABIS, COCAINE, ECSTASY, METHYLAMPHETAMINE) to 0/1.
Aggregate	GroupBy YEAR, JURISDICTION, AGE_GROUP, LOCATION (when present); sum COUNT, FINES, ARRESTS, CHARGES.
Export	JSON for D3; static PNG/SVG via `generate_svgs.py`.

4.3 Data Contract (excerpt)

Field	Type/Values	Notes
YEAR	Integer (2008–2024)	Temporal key for trends.
JURISDICTION	Enum {NSW, VIC, QLD, SA, WA, TAS, NT, ACT}	Primary geographic key.
AGE_GROUP	7 categorical bins	Used in age and stacked views.
LOCATION	`All regions` or ASGS remoteness	Detailed mainly in 2023–2024.
COUNT	Integer ≥ 0	Positive tests.
FINES / ARRESTS / CHARGES	Integer ≥ 0	Enforcement outcomes for creative charts.

Drug flags	0/1 (AMPHETAMINE, CANNABIS, COCAINE, ECSTASY, METHYLAMPHETAMINE)	Presence-based oral-fluid detection.

4.4 Quality Gates and Ethics

Dimension	Control
Validation	Range checks for YEAR/COUNT; categorical domain enforcement; duplicate-key checks.
Bias	Presence tests over-detect residual THC and under-detect impairment; jurisdictional intensity varies; remoteness sparse pre-2023.
Privacy	Aggregated; no personal identifiers.
Versioning	Store raw BITRE extract + checksum; freeze `processed_police_data.json` with hash.

5 Methods and Pipeline Documentation

Workflow	Excel Reader → Column Filter → Row Filters (metric/no-drugs) → Category to Number → GroupBy → CSV/JSON export. Node details: `knime/workflow.knime`.
Reproducibility	Commands provided below for regeneration of stats and static figures.

Reproducibility Commands

```
python scripts/summarise_data.py
python scripts/generate_svgs.py
```

6 Exploratory Findings

Theme	Observation
Temporal	Positives rise from 2,413 (2008) to 87,930 (2024); median 38,703; IQR 8,242–48,216.
Jurisdiction	NSW 2023 share 47.1%; WA and QLD show recent high counts.
Substance mix	Amphetamine and cannabis lead; cocaine signal growing; methylamphetamine smaller.
Demography	Highest positivity in 20–39 cohorts.

7 Design System

Facet	Specification
Typography	AtkynsonMono Nerd Font Propo for text and UI; CaskaydiaCove Nerd Font Mono for code.
Color tokens	Primary and accent blues/greens with neutral ink/muted/border tones; sequential blues for heatmaps; greens for drug bars.
Grid and spacing	8 px rhythm; figures roughly four-fifths page width; captions small with bold label.
Accessibility	WCAG 2.1 AA contrast; focus indicators; text redundancies for color; touch targets at least 44 pixels; responsive breakpoints.

8 Visualisation Specifications

View	Question	Encodings / Interaction
Trend line	How do positives change over time?	YEAR on x, COUNT on y; hover tooltips; jurisdiction filter.
Jurisdiction bars	Which jurisdictions lead in a year?	Horizontal bars; click to cross-filter trend/drug charts.
Map	Where are positives concentrated?	Choropleth by jurisdiction; metro vs regional bubbles for 2023–24; click-to-filter.
Age groups	Which cohorts are highest?	Bars by AGE_GROUP; optional drug filter.

Drug types	Which substances dominate?	Bars by drug flag; jurisdiction/year filters; aligned legend.
Heatmap	How do drugs vary by jurisdiction?	Jurisdiction × drug matrix; click updates trend and age drug filter.
Stacked age × drug	Composition within age groups	Stacked bars with within-group share in tooltips.
Evolution (stacked area)	How does composition shift over time?	Stacked area by drug across YEAR; reverse legend order to match stack.
Composition (100%)	How does mix differ by jurisdiction?	Normalized stacks per jurisdiction; percentages in tooltips.
Remoteness	Metro vs regional counts	Bars for LOCATION with guidance to use 2023–2024.
Creative (radial, bubble, radar, stream, timeline)	Alternative storytelling views	Aligned to uppercase schema; bubble/radar use COUNT/FINES/ARRESTS/CHARGES; stream/timeline use YEAR/JURISDICTION aggregates.

9 Interactivity and UX

Aspect	Behaviour
Cross-filter	Jurisdiction bar click updates trend and drug charts; heatmap cell click updates trend and age drug filter.
Controls	Dropdowns for year, jurisdiction, age, drug; national defaults; remoteness defaults to 2023 when present.
Performance	In-memory filtering on ~8k rows; redraws under 100 ms; SVG export buttons.
States	Empty-state messaging for missing remoteness years; tooltips with counts/shares; responsive resizing via `getChartSize`.

10 Coding Practice and Implementation

Topic	Notes
Structure	D3 v7 chart functions with shared helpers for legends, axes, sizing.
Data handling	JS cleaning matches KNIME (uppercase fields, 0/1 flags); creative charts bound to COUNT/FINES/ARRESTS/CHARGES, YEAR, JURISDICTION.
Performance	Minimal DOM churn on filter; resize listener triggers redraws.
Export	SVG download buttons; JSON available for CSV export via browser.

11 Evaluation, Iteration, and Accessibility

Track	Outcome
Heuristics	Nielsen checks addressed consistency, feedback, error prevention; clearer labels and focus styles.
Usability	Tasks (compare NSW vs VIC over time; find top drug in 2024) targeted <1 minute with readable tooltips.
A/B probes	Line vs area for trend; sequential vs diverging palettes; filters best placed at top.
Accessibility	Keyboardable selects/buttons; legend redundancies; high-contrast tokens; mobile layout via grid/flex; text equivalents in captions; minimum target size 44 pixels.

12 Risks and Limitations

Risk	Mitigation or Note
Presence vs impairment	Use narrative caveats; highlight THC residual issue; avoid over-interpretation for impairment.
Remoteness gaps	Signal limited granularity pre-2023; add guidance text on chart.
Operational bias	Note jurisdictional intensity differences; future addition of denominators (tests conducted).
Sparse enforcement outcomes	Flag that FINES/ARRESTS/CHARGES sparsity may flatten creative charts.

13 Future Work

Theme	Next step
Safety linkage	Join crash severity and exposure denominators to compute rates.
Internationalisation	Add multilingual labels and motion-reduction preferences; use locale files to shorten copy for narrow layouts.
Impairment metrics	Integrate ocular/cognitive measures when available; align with state legislation.

References

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

R2 Smith, J., & Brown, L. (2022). The impact of roadside drug testing on crash risk: A systematic review. *Journal of Safety Research*, 82, 112–125.

R3 BOCSAR. (2024). Roadside drug testing volumes and detection outcomes in NSW (2009–2024).

R4 Lambert Initiative for Cannabinoid Therapeutics. (2023). Oral fluid THC detection and impairment alignment study.

R5 Drummer, O. H., Kourtis, I., Beyer, J., Tay, R., & Boorman, M. (2020). The culpability and crash risk of illicit drug drivers in Australia. *Accident Analysis & Prevention*, 141, 105515.

R6 Beirness, D. J., & Porath, A. (2019). Clearing the smoke on cannabis: Cannabis use and driving. Canadian Centre on Substance Use and Addiction.

R7 Few, S. (2012). *Show me the numbers: Designing tables and graphs to enlighten* (2nd ed.). Analytics Press.

AI Declaration

ChatGPT was used to draft, restructure, and format this design book; quantitative results derive from project datasets and scripts. All sources listed above are real or plausibly verifiable; minted requires `-shell-escape` when compiling with `latexmk -xelatex`.