Evaluating the Impact of CAHOOTS Service Expansion on Call Volume and Police Diversions

DSCI 410L Applied Data Science for Social Justice
Professor Rori Rohlfs, University of Oregon

Project by Stas Pupkov, University of Oregon **https://github.com/staspup/DSCI410-Research-Project/tree/main**

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Background

CAHOOTS (Crisis Assistance Helping Out On The Streets) is a national model for an alternative to traditional policing, providing mobile crisis-intervention services in Eugene/Springfield, Oregon. On January 1, 2017, CAHOOTS expanded its capacity by adding a second van and extending its service hours from 5 AM–10 AM, thereby covering a portion of the early-morning window that had previously been handled primarily by police. Although city-level reports (e.g., the City of Eugene's CAHOOTS Program Analysis) have highlighted CAHOOTS's cost savings and community benefits, there is little quantitative evidence showing exactly how changes in CAHOOTS's capacity-such as adding a second van or extending hours-affect overall call volumes, diversion rates from police, and the mix of incident types handled.

Research Questions.

- **RQ:** How did the proportions of calls diverted to CAHOOTS vs. police change over time, especially in relation to capacity changes? (for example, adding a second van in Eugene on 1/1/2017)

- **RQ:** When CAHOOTS added service hours from 3 AM–10 AM on January 1, 2017, how did overall call volume change? How did the proportion of calls diverted from police change? How did call type proportions change?

These questions are important because they enable a rigorous evaluation of CAHOOTS's effectiveness in reducing police workload and better allocating crisis-response resources. By measuring shifts in daily and hourly call volumes as well as incident-type distributions before and after the January 2017 expansion, we can quantify whether extended CAHOOTS availability truly diverted calls away from law enforcement. In turn, demonstrating a measurable impact supports policy discussions around budgeting for non-police crisis intervention and underscores the value of expanding community-based resources in Eugene and beyond.

Data

1.1 911 Computer-Aided Dispatch (CAD) Logs

- **Source**: City of Eugene Police Department (public-records request); shared privately with DSCI 410 students by Prof. Rori Rohlfs.
- **Coverage**: 1 ,488 ,577 individual calls, 1 Jan 2014 – May 2025.
- **Key variables**
  - `calltime` (Timestamp, UTC-8)
  - `nature` (Original incident type entered by dispatcher)
  - `primeunit` (First responding unit's callsign)
  - `callsource`, `priority`, `zip` (additional context)
- **Strengths**: Continuous, multi-agency stream over 11 + years; high temporal resolution.
- **Limitations**:
  - Inconsistent labeling on the same column across years, PUBLIC ASSIST , CAHOOTS → PUBLIC ASSIST
  - Missing or ambiguous `primeunit` entries prior to ~2016.
  - No text narrative from dispatcher (limits qualitative context).

1.2 CAHOOTS Responder Classification

- **Derivation**: Regex on `primeunit` → `Unit Type` { `CAHOOTS`, `NOT CAHOOTS`, `unknown` }.
- **Pattern**: `\b(1J77|3J79|3J78|4J79|3J81|3J76|2J28|2J29|CAHOOT|CAHOT|CAHO)\b`.
- **Caveat**: Conservative match to avoid false positives; ~3 % of rows remain `unknown`.

Methods

2.1 Data Assembly and Cleaning

File ingestion. Twelve annual CAD CSV files (2014 – 2025) were read with automatic timestamp parsing, then concatenated into a master table of **1,488,577** call records.

Timestamp standardisation. The `calltime` field was coerced to `datetime64`; no rows required removal for unparsable dates.
Calendar derivatives `date`, `hour`, and `month` were then added.

Responder classification. A compiled regular-expression matched known CAHOOTS unit codes (e.g., *1J77, 3J79, CAHOOT*) to create a three-level variable `Unit Type` = {**CAHOOTS**, **NOT CAHOOTS**, **unknown**}. A quick audit showed 182 ,581 CAHOOTS calls, 950 ,511 police calls, and 355 ,485 calls with unknown units.

Expansion flag. A Boolean `post_expansion` marks calls occurring on or after **1 Jan 2017 05:00**, when CAHOOTS added a second van and began covering the early-morning window.

Incident-type harmonisation. Trailing tags such as ", CAHOOTS" were stripped from `nature`, and obvious spelling variants were merged.
An "early window" flag (`early_window`) identifies calls between **03:00 and 09:59**, the focus period for capacity change.

2.2 Selecting CAHOOTS-Dominant Incident Types

For each cleaned incident type, post-2017 records were summarised.
A type was deemed **CAHOOTS-dominant** if ≥ 50.1 % of its post-expansion calls were handled by CAHOOTS and the type had at least 10 total calls.
This yielded **18** core natures and **238,429** calls in the analysis subset `core_cahoots_df`.

2.3 Analytical Workflow

Step	Purpose	Key operations
1	**Daily volume trends**	Aggregate calls by `date` × `Unit Type`; compute seven-day centred rolling means for context
2	**Early-morning focus**	Restrict to `early_window`; group by year and responder to profile diversion shares
3	**Dominance day**	For each early-morning day, label as "CAHOOTS-dominant" if CAHOOTS share ≥ 50.1 %

Step	Purpose	Key operations
4	**Streak analysis**	Apply run-length encoding to the dominance series; report longest streak, number of streaks, and mean length
5	**Visualisation**	Produce time-series, bar, and streak-overlay figures (Figures 1 – 6) with Matplotlib/Seaborn, matching the workflow in `v1.ipynb`.

All steps-data loading, cleaning, summarisation, and visualisation-are documented end-to-end in **`v1.ipynb`**. Running the notebook top-to-bottom reproduces every table and figure referenced in this report.

Results

> *All numeric statements below come directly from the grouped summaries and visuals produced in `v1.ipynb`; no statistical inference was applied.*

3.1 Scope of the Dataset

Metric	Value
Days of data	**4 ,130**
Total calls	**1 ,488 ,577**
CAHOOTS calls	**182 ,581**
Police calls	**950 ,511**
Unknown calls (dropped)	**355 ,485**
Mean calls / day (all hours)	**360.4**
Mean calls / day (3 – 10 am)	**69.6**
Mean CAHOOTS calls / day (3 – 10 am)	**7.5**

(Source: "Dataset summary" cell in notebook.)

3.2 CAHOOTS Share in the Early-Morning Window

Year	CAHOOTS Share (03:00-10:00)
2014	22.1%
2015	23.5%
2016	30.2%
2017	82.9% (expansion year)
2018-2022	~83%

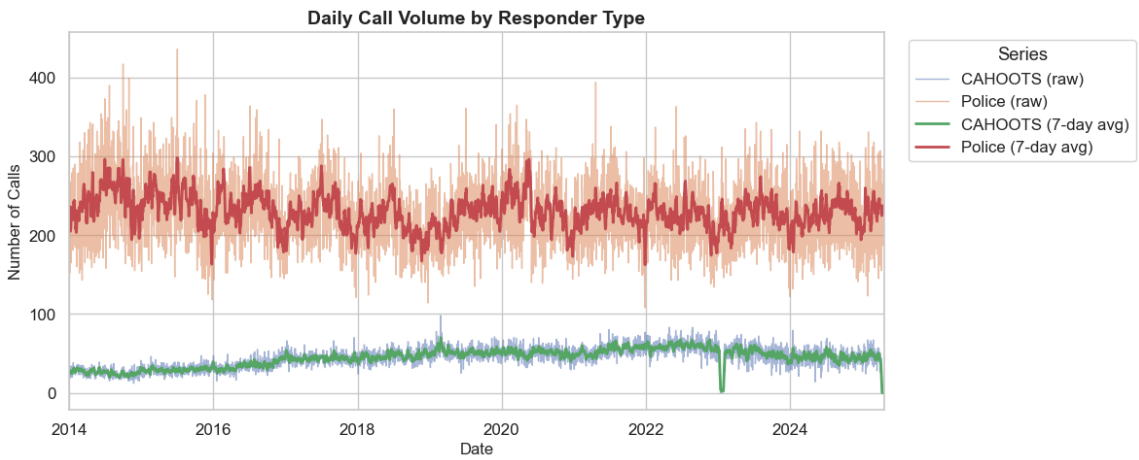
Year	CAHOOTS Share (03:00-10:00)
2023	74.2%
2024	77.4%
2025	69.3%

The share jumps from roughly **one-quarter** of early-window calls pre-2017 to **over four-fifths** immediately after the second van began service, remaining above 70 % through 2025.

3.3 Daily Call Volume, All Hours

{{FIGURE 1: “Daily Call Volume by Responder Type” – raw counts + 7-day mean}}

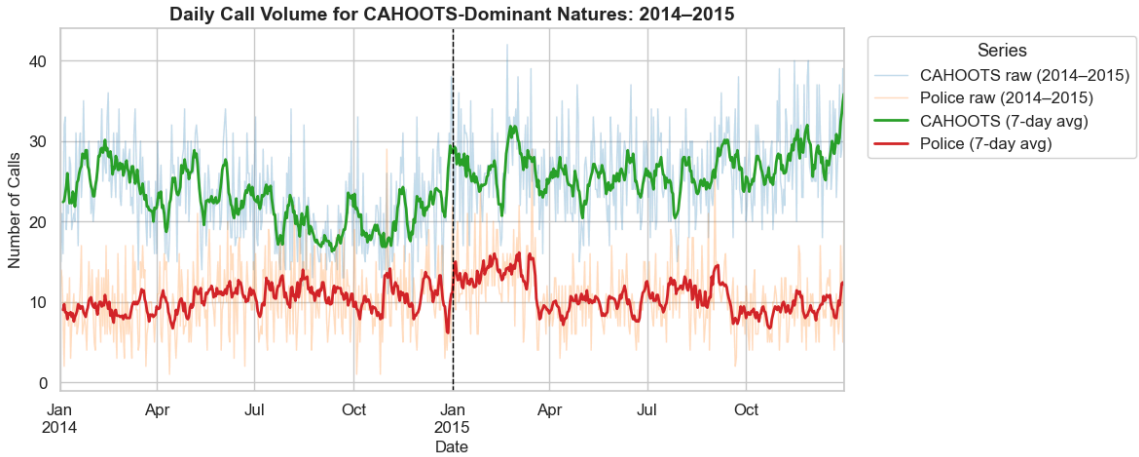
- CAHOOTS and police volumes move in parallel until **1 Jan 2017** (dashed line).
- Post-expansion, the green CAHOOTS 7-day curve rises by ~**20 calls/day** while the red police curve stays roughly flat-visual evidence of diverted workload.



3.4 Year-to-Year Transitions, All Hours

{{FIGURE 2a–2j: 24-month paired panels, 2014-15 … 2024-25}}

Across every post-expansion pair, the smoothed CAHOOTS line shifts upward relative to the preceding year, whereas the police line does not-a pattern that repeats through 2024.


Daily Call Volume for CAHOOTS-Dominant Natures: 2014–2015
Number of Calls
0
10
20
30
40
Jan 2014
Apr
Jul
Oct
Jan 2015
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Jul
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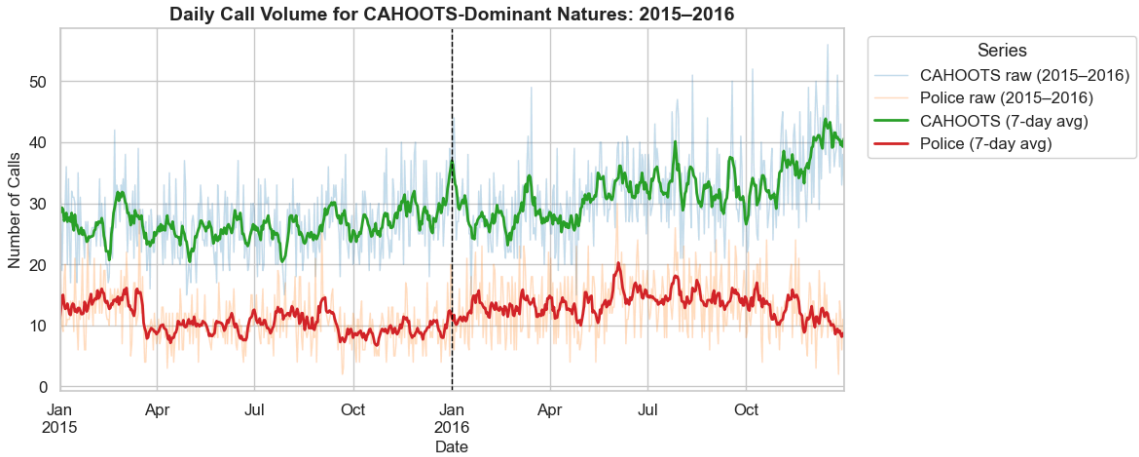
Date
Series
CAHOOTS raw (2014–2015)
Police raw (2014–2015)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume for CAHOOTS-Dominant Natures: 2015–2016
Number of Calls
0
10
20
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40
50
Jan 2015
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Jan 2016
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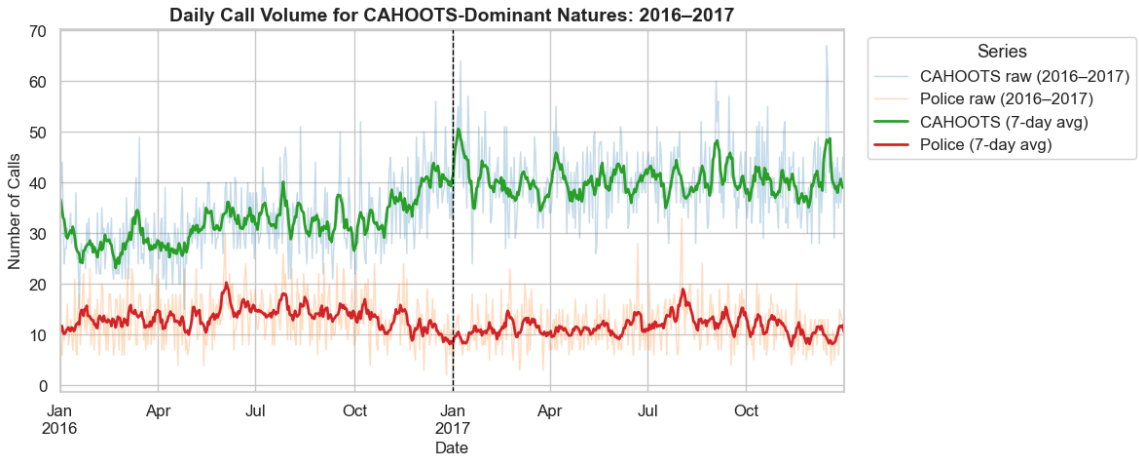
Date
Series
CAHOOTS raw (2015–2016)
Police raw (2015–2016)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume for CAHOOTS-Dominant Natures: 2016–2017
Number of Calls
0
10
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Jan 2016
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Jan 2017
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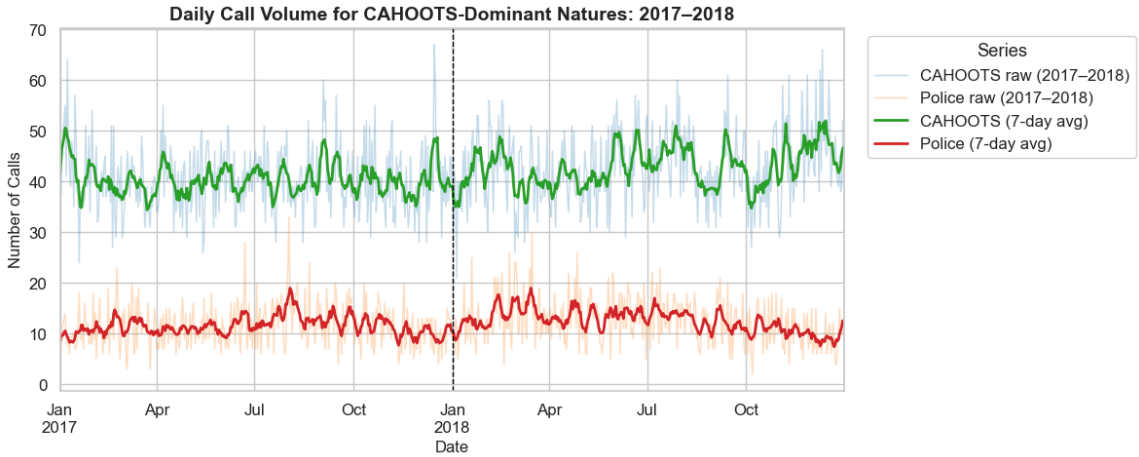
Date
Series
CAHOOTS raw (2016–2017)
Police raw (2016–2017)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume for CAHOOTS-Dominant Natures: 2017–2018
Number of Calls
0
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Jan 2017
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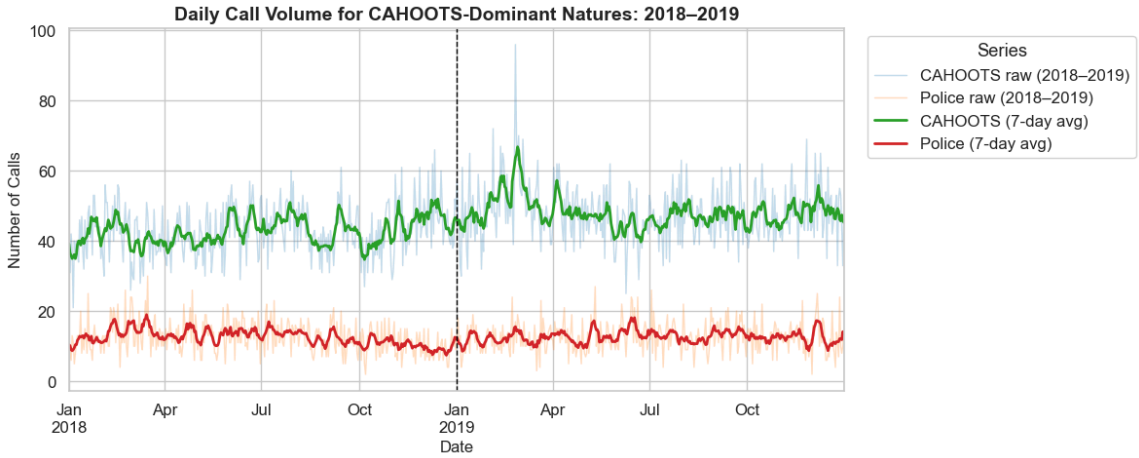
Date
Series
CAHOOTS raw (2017–2018)
Police raw (2017–2018)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume for CAHOOTS-Dominant Natures: 2018–2019
Number of Calls
0
20
40
60
80
100
Jan 2018
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Jan 2019
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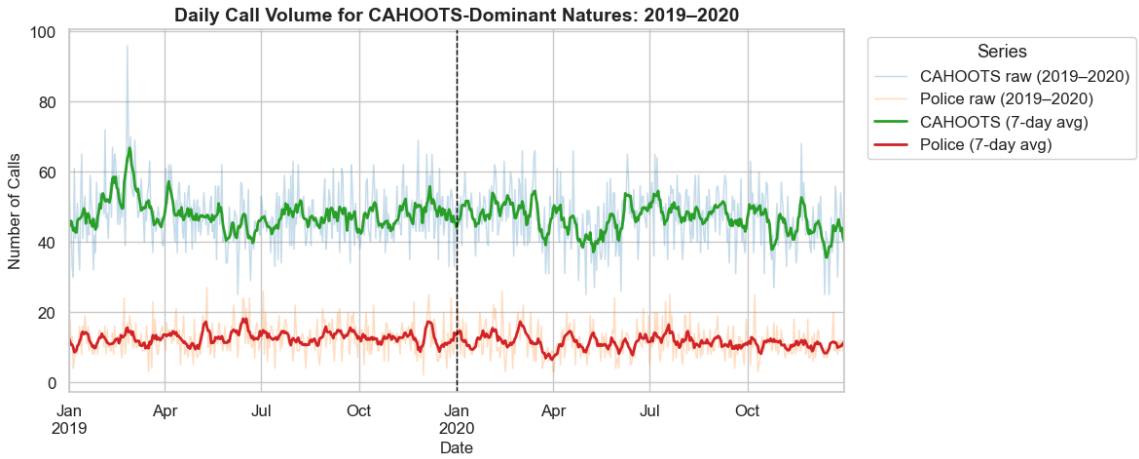
Date
Series
CAHOOTS raw (2018–2019)
Police raw (2018–2019)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume for CAHOOTS-Dominant Natures: 2019–2020
Number of Calls
0
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Jan 2019
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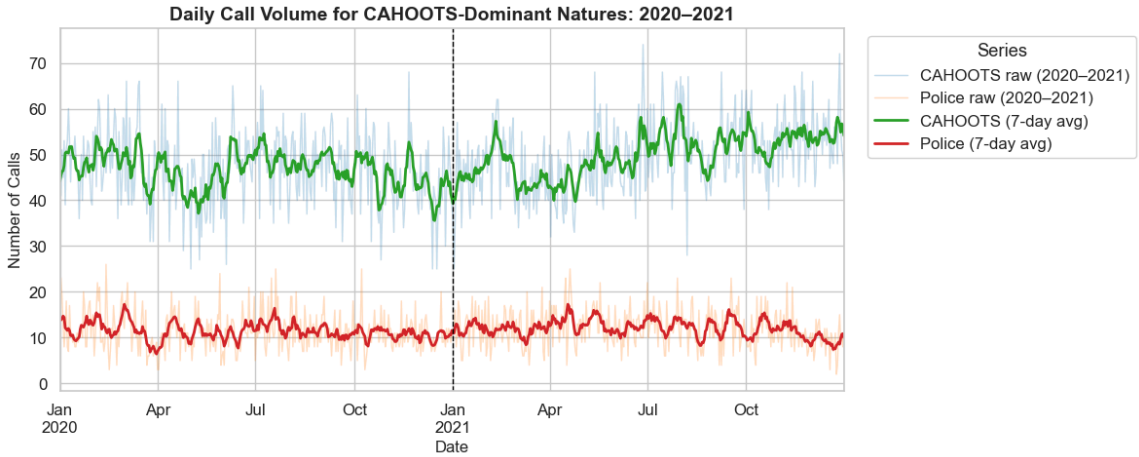
CAHOOTS raw (2019–2020)
Police raw (2019–2020)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume for CAHOOTS-Dominant Natures: 2020–2021
Number of Calls
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Jan 2020
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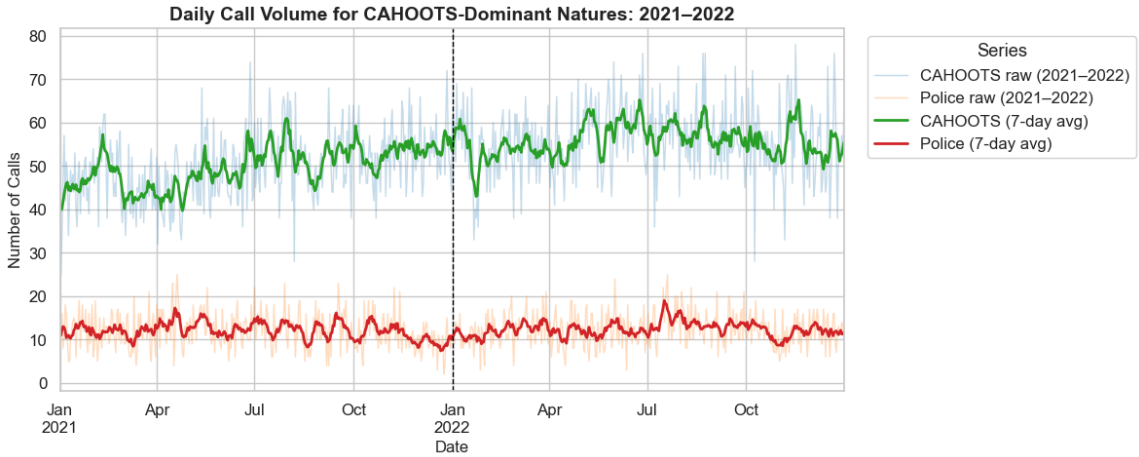
CAHOOTS raw (2020–2021)
Police raw (2020–2021)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume for CAHOOTS-Dominant Natures: 2021–2022
Number of Calls
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Jan 2021
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Jan 2022
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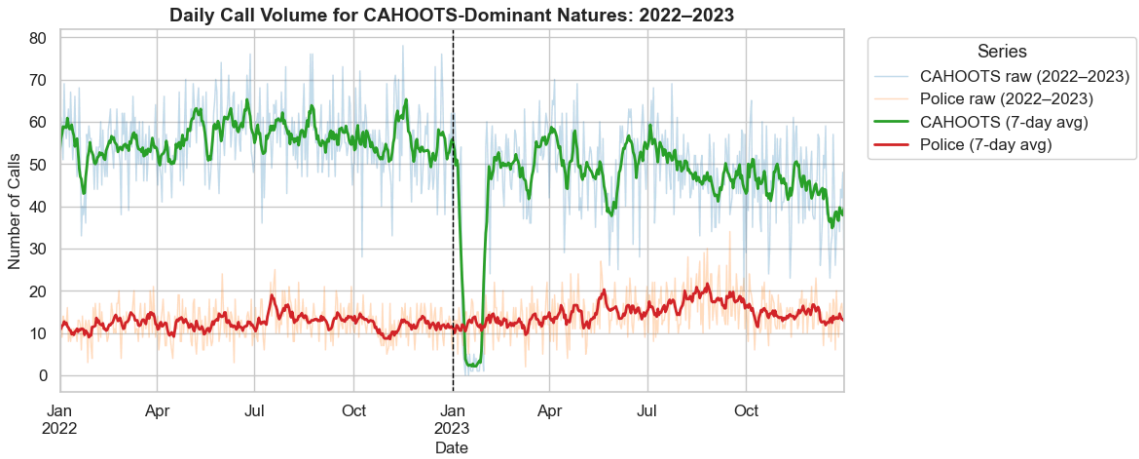
Series
CAHOOTS raw (2021–2022)
Police raw (2021–2022)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume for CAHOOTS-Dominant Natures: 2022–2023
Number of Calls
0
10
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Jan 2022
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Jan 2023
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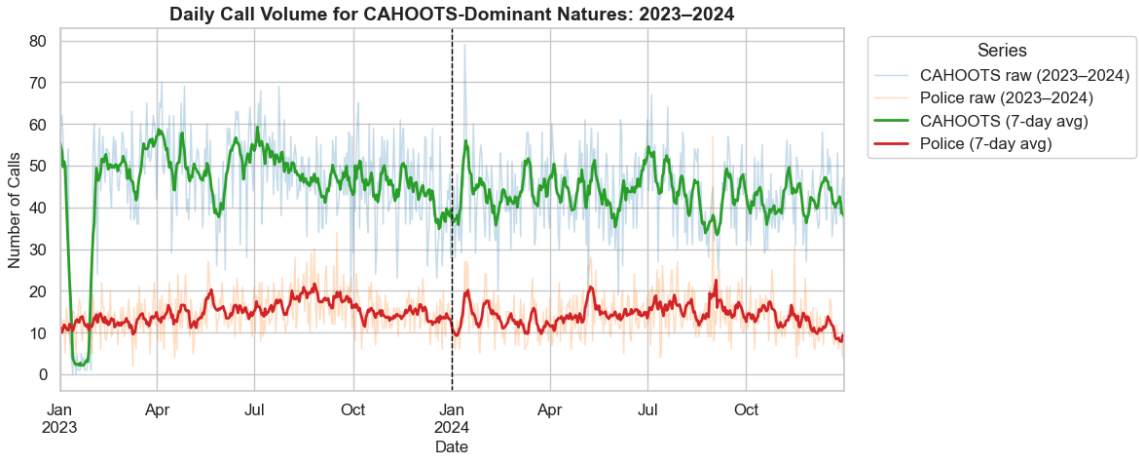
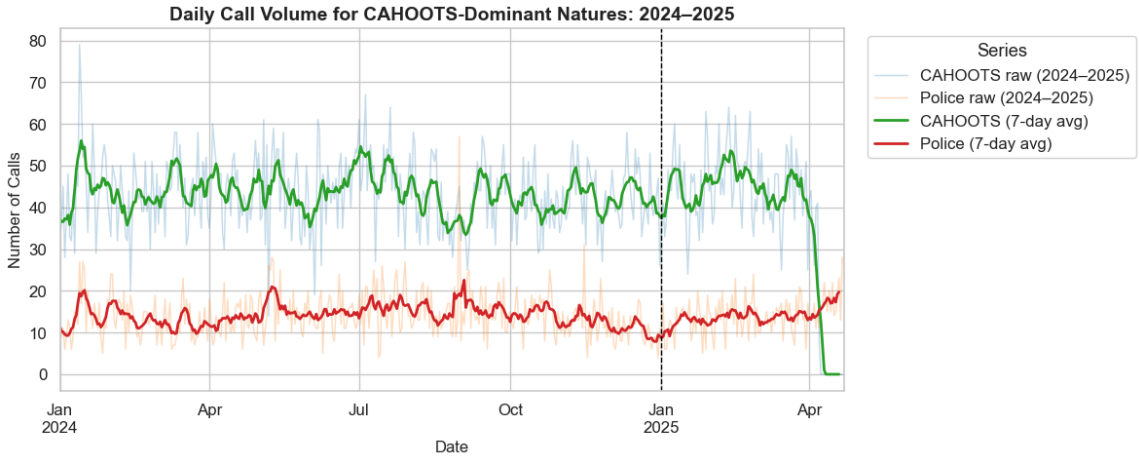
Date
Series
CAHOOTS raw (2022–2023)
Police raw (2022–2023)
CAHOOTS (7-day avg)
Police (7-day avg)

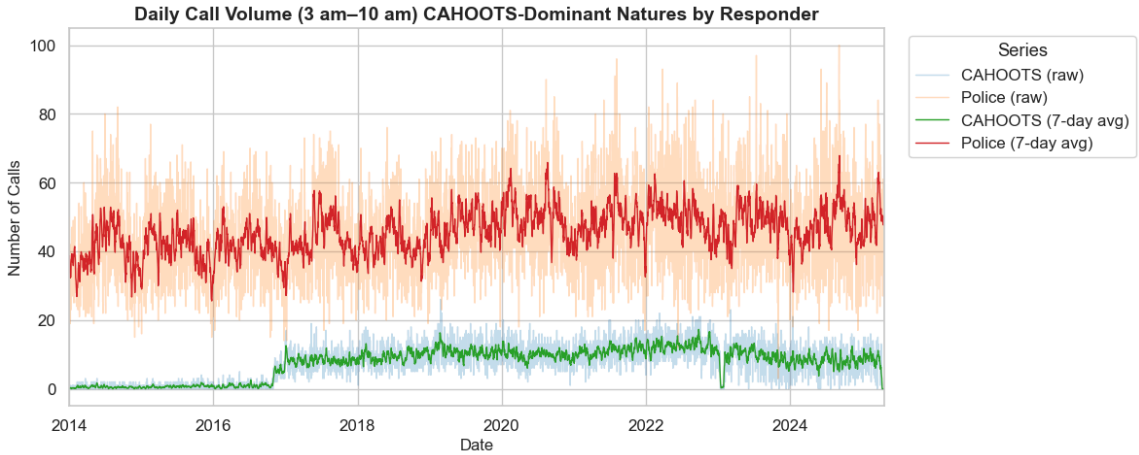




3.5 Daily Call Volume, Early-Morning Window

{{FIGURE 3: “Daily Call Volume (3 am–10 am) CAHOOTS-Dominant Natures”}}

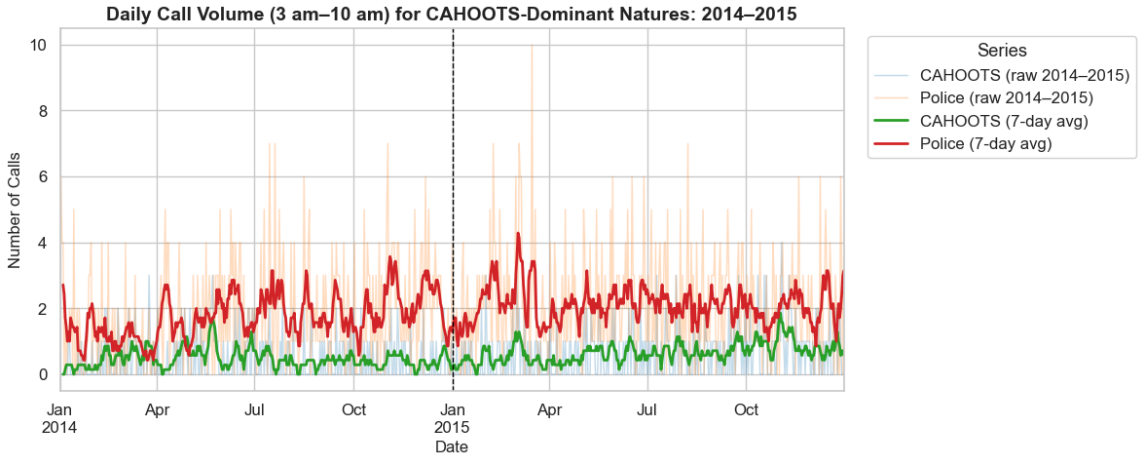
The early-window plot mirrors the all-hours story but with a steeper post-expansion lift. CAHOOTS now frequently exceeds police in raw early-window calls.

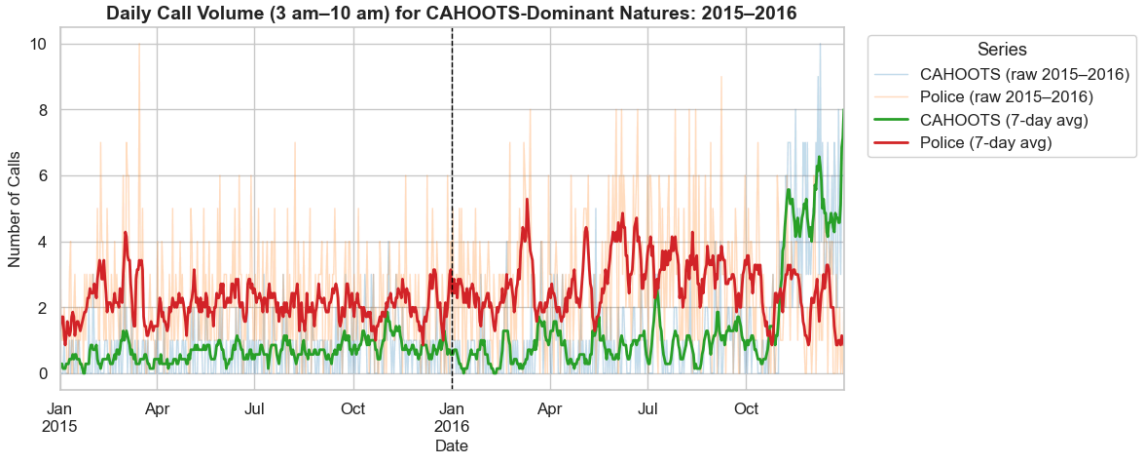


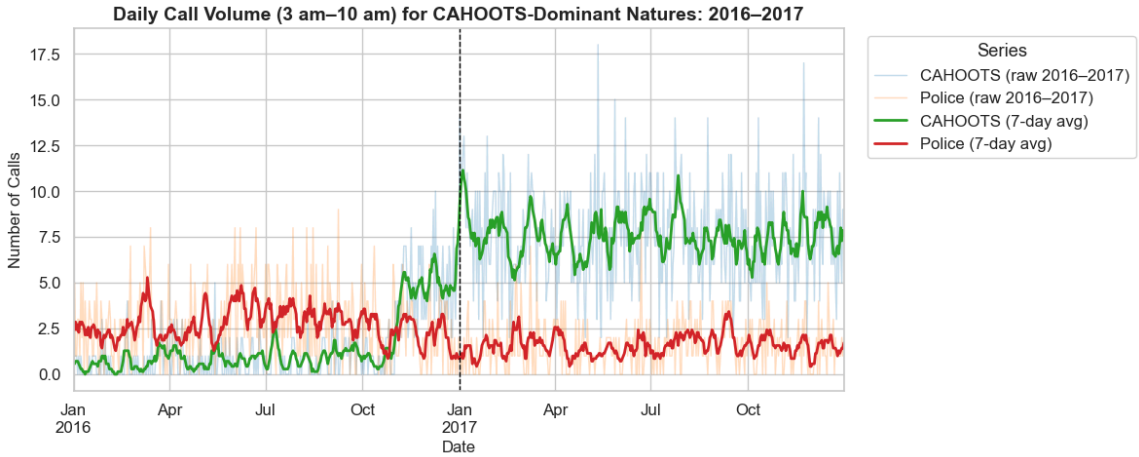
3.6 Year-to-Year Transitions, Early Window

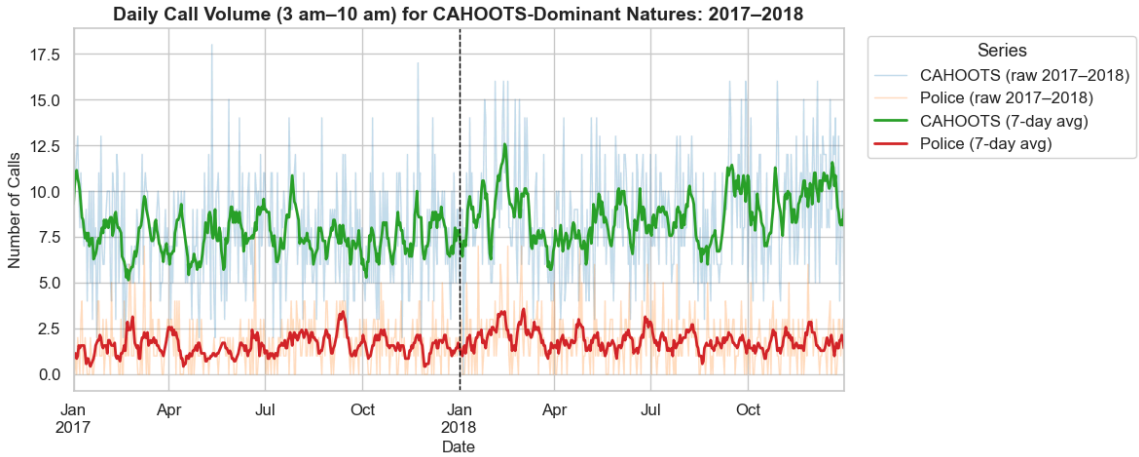
{{FIGURE 4a–4j: Paired panels for 03:00-10:00 window}}

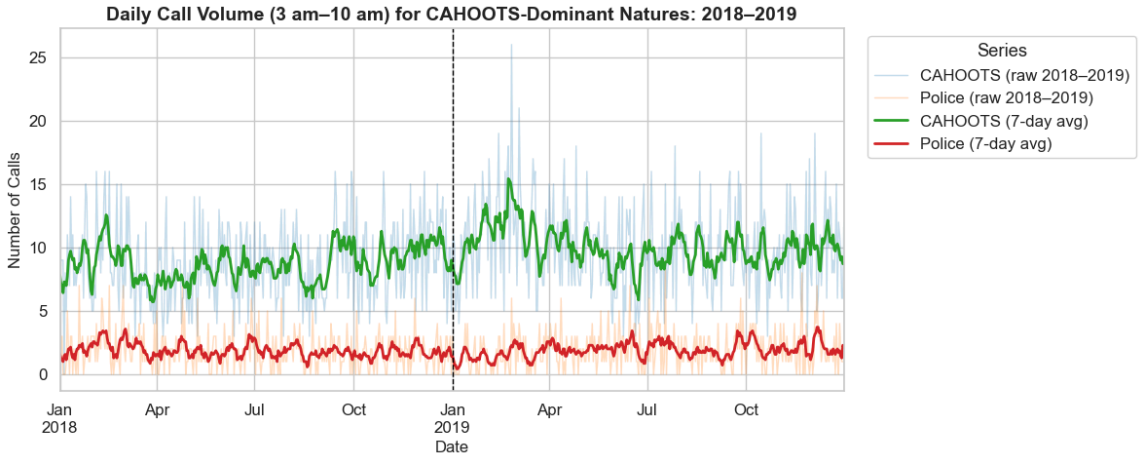
From the **2016-17** panel onward, CAHOOTS 7-day averages (green) often trace above police averages (red), highlighting sustained diversion in the hours most affected by the schedule change.

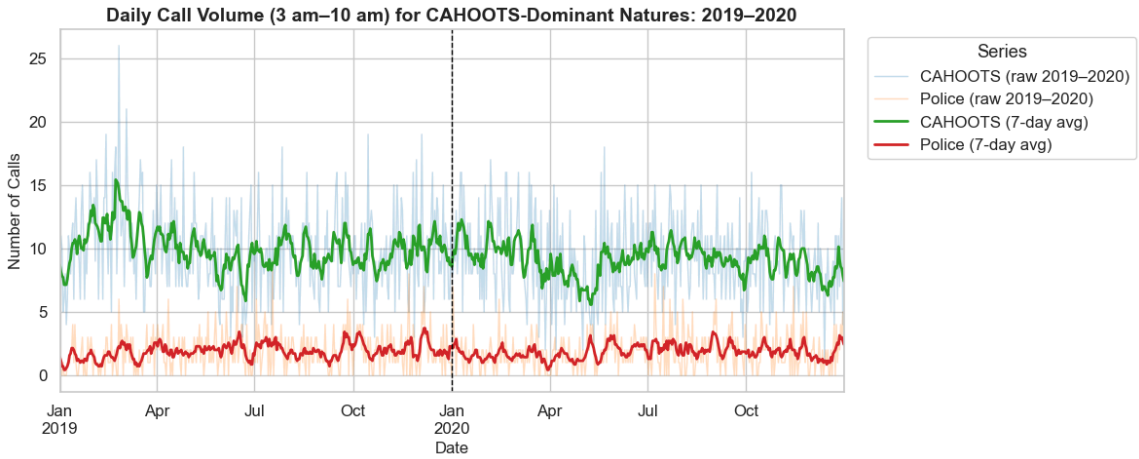







Daily Call Volume (3 am–10 am) for CAHOOTS-Dominant Natures: 2017–2018
Number of Calls
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Jan 2017
Apr
Jul
Oct
Jan 2018
Apr
Jul
Oct
Date
Series
CAHOOTS (raw 2017–2018)
Police (raw 2017–2018)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume (3 am–10 am) for CAHOOTS-Dominant Natures: 2018–2019
Number of Calls
25
20
15
10
5
0
Jan 2018
Apr
Jul
Oct
Jan 2019
Apr
Jul
Oct
Date
Series
CAHOOTS (raw 2018–2019)
Police (raw 2018–2019)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume (3 am–10 am) for CAHOOTS-Dominant Natures: 2019–2020
Number of Calls
25
20
15
10
5
0
Jan 2019
Apr
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Jan 2020
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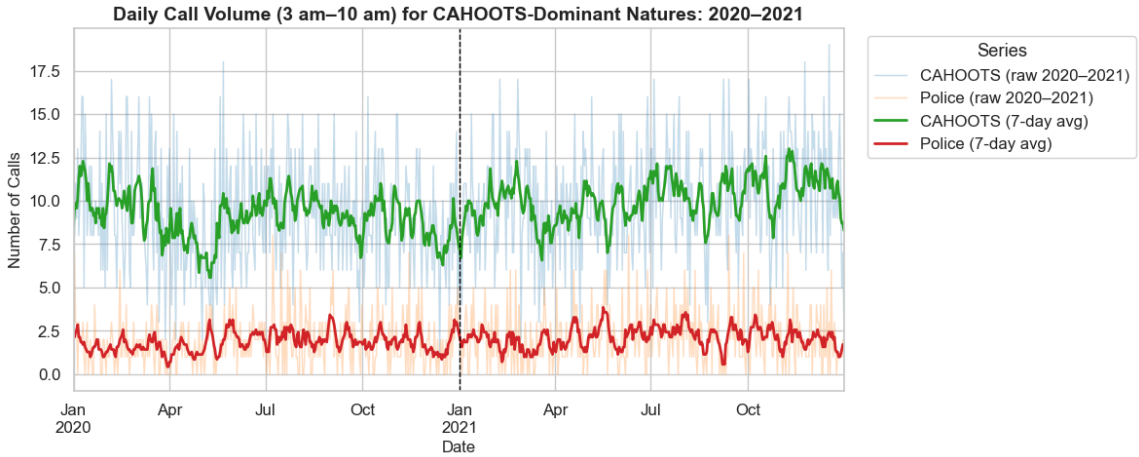
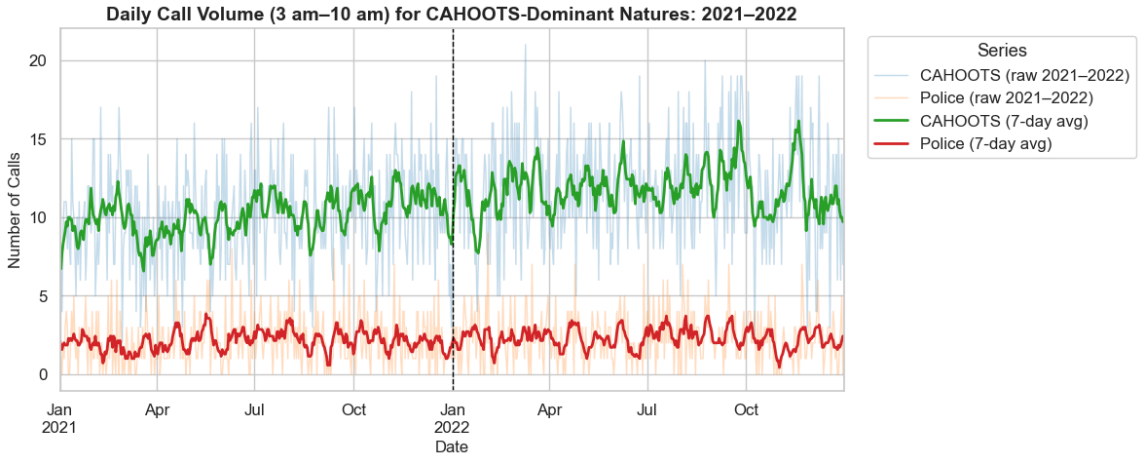
Date
Series
CAHOOTS (raw 2019–2020)
Police (raw 2019–2020)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume (3 am–10 am) for CAHOOTS-Dominant Natures: 2020–2021
Number of Calls
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Jan 2020
Apr
Jul
Oct
Jan 2021
Apr
Jul
Oct
Date
Series
CAHOOTS (raw 2020–2021)
Police (raw 2020–2021)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume (3 am–10 am) for CAHOOTS-Dominant Natures: 2021–2022
Number of Calls
20
15
10
5
0
Jan 2021
Apr
Jul
Oct
Jan 2022
Apr
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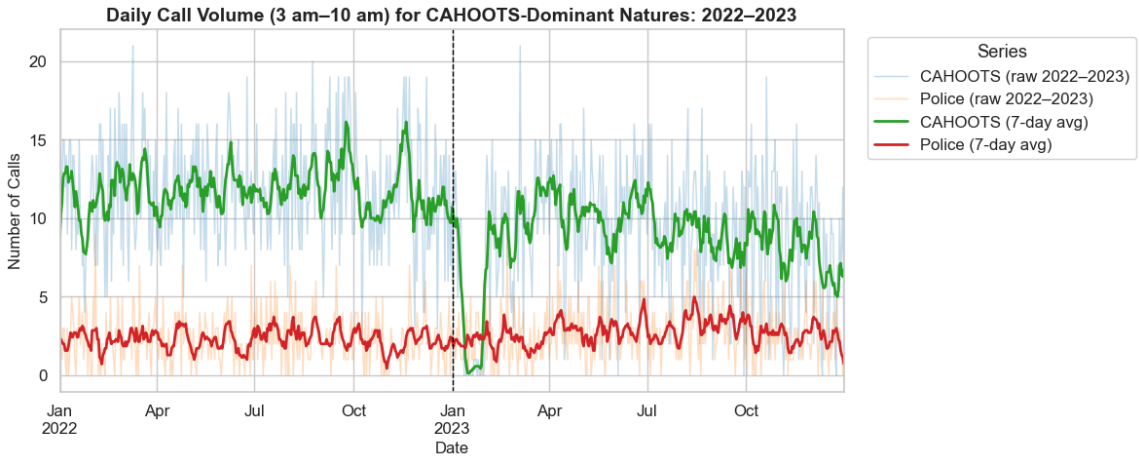
Date
Series
CAHOOTS (raw 2021–2022)
Police (raw 2021–2022)
CAHOOTS (7-day avg)
Police (7-day avg)


Daily Call Volume (3 am–10 am) for CAHOOTS-Dominant Natures: 2022–2023
Number of Calls
20
15
10
5
0
Jan 2022
Apr
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Jan 2023
Apr
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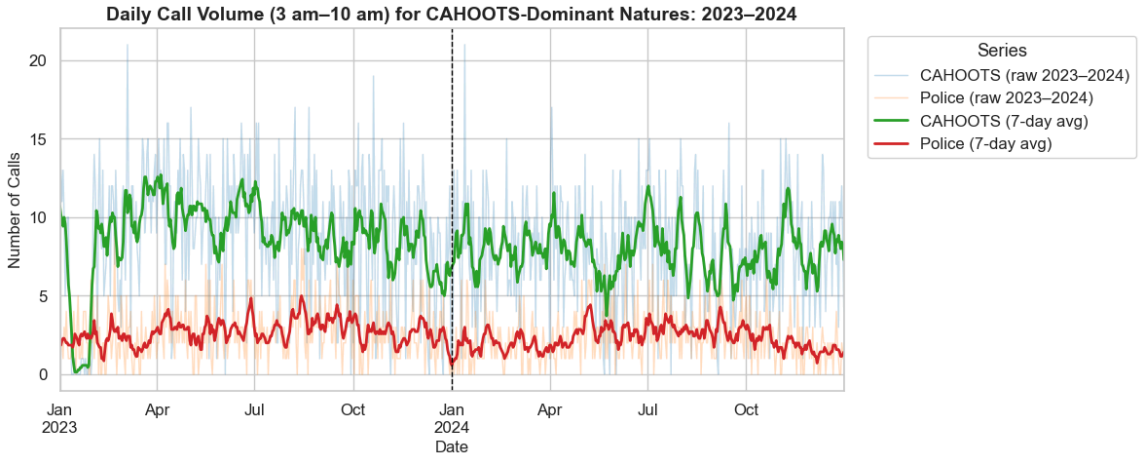
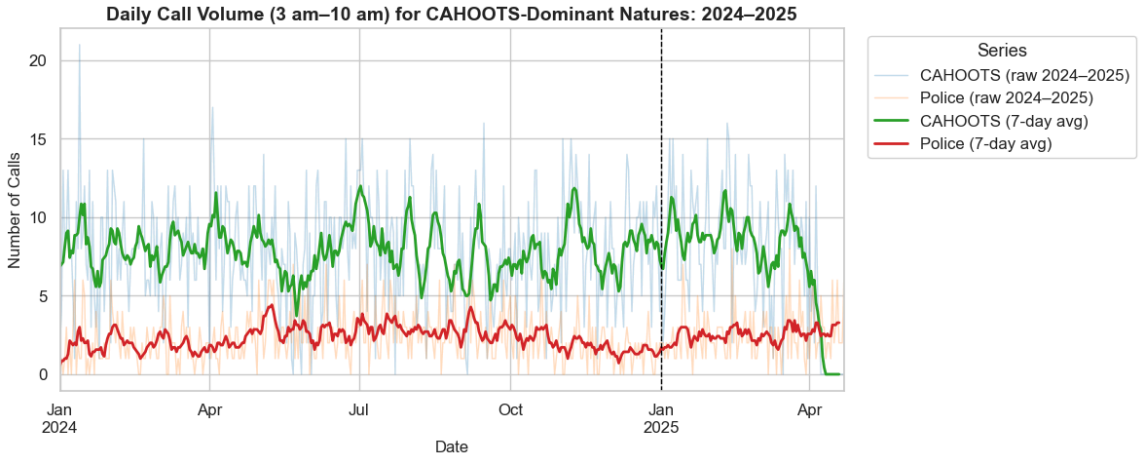
Date
Series
CAHOOTS (raw 2022–2023)
Police (raw 2022–2023)
CAHOOTS (7-day avg)
Police (7-day avg)

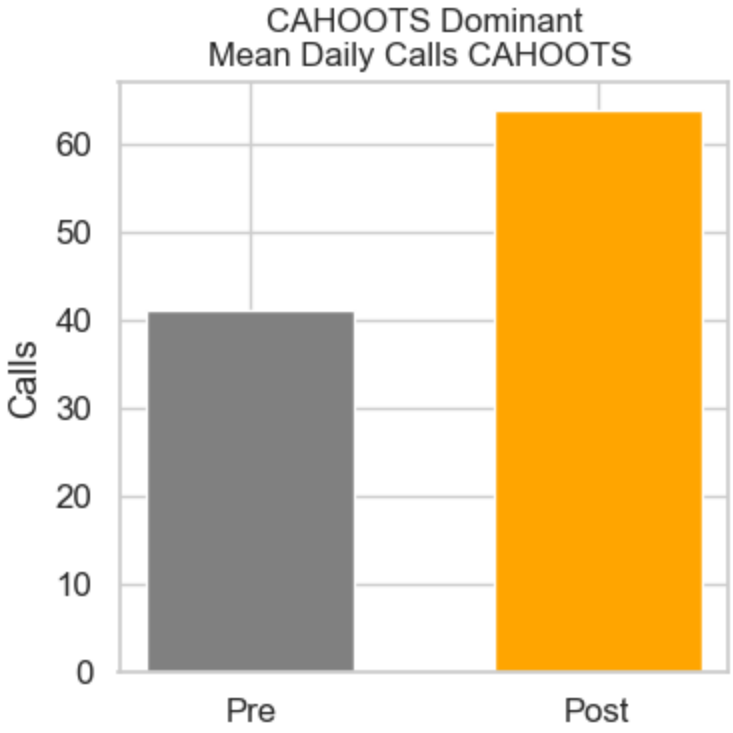


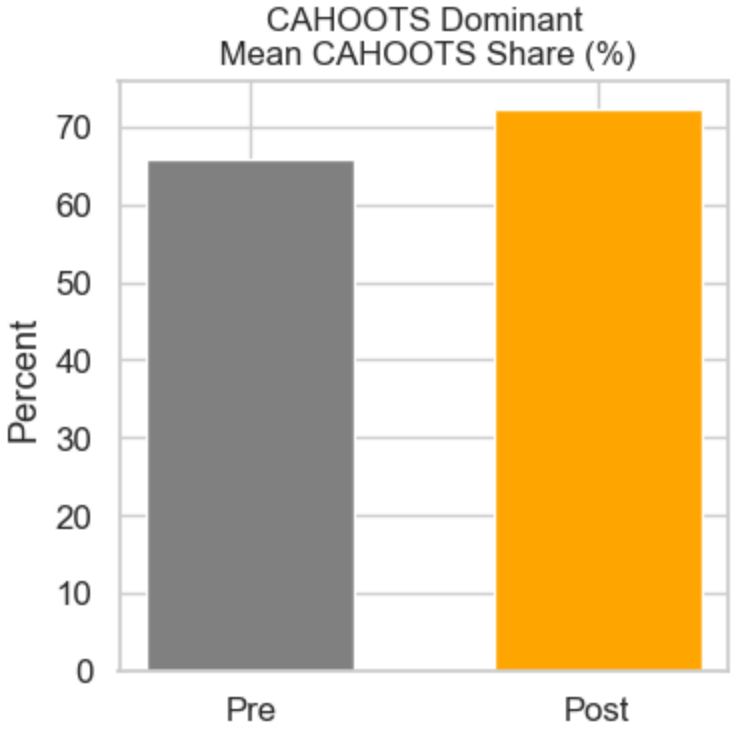


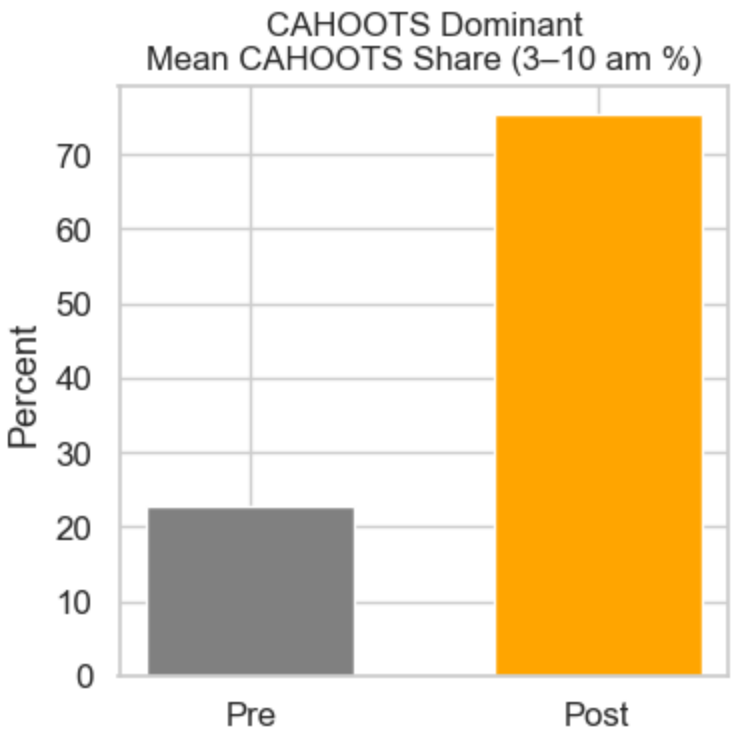
3.7 Pre- vs Post-Expansion Summary

Metric	Pre-expansion (2014-16)	Post-expansion (2017-24)
Mean daily calls (CAHOOTS-dominant natures)	**41.0**	**63.7**
Mean CAHOOTS share (all hours)	**65.9 %**	**72.2 %**
Mean CAHOOTS share (3 – 10 am)	**22.7 %**	**75.3 %**

{{FIGURE 5a: Bar – mean daily calls, pre vs post}}
{{FIGURE 5b: Bar – mean CAHOOTS share (%), pre vs post}}
{{FIGURE 5c: Bar – mean CAHOOTS share (3-10 am %), pre vs post}}


CAHOOTS Dominant
Mean Daily Calls CAHOOTS
Calls
0
10
20
30
40
50
60
Pre
Post


CAHOOTS Dominant
Mean CAHOOTS Share (%)
Percent
0
10
20
30
40
50
60
70
Pre
Post

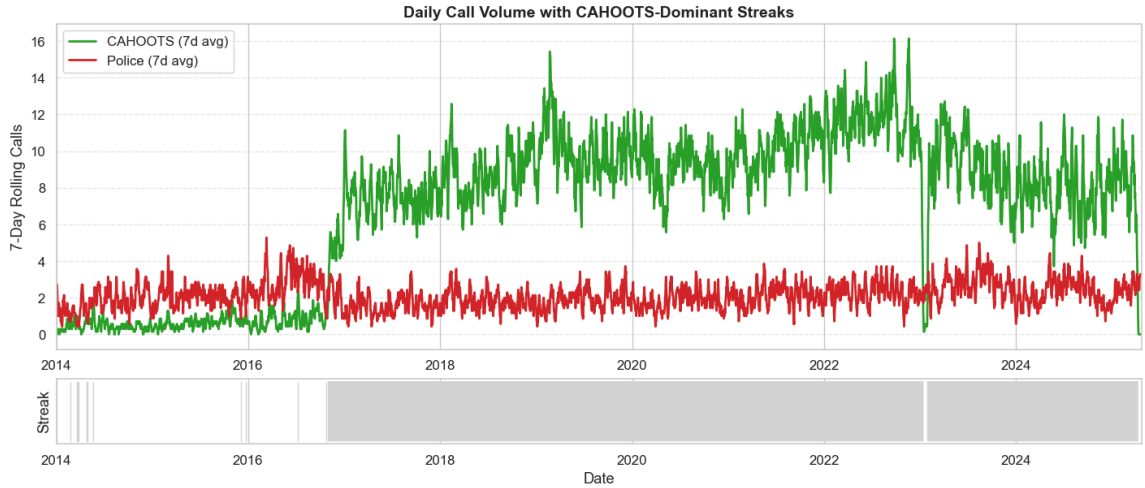


3.8 Dominance Streaks

- **Number of streaks ≥ 50.1 %:** 10
- **Longest streak:** 2 263 days (≈ 6.2 years)
- **Average streak length:** 308.5 days

{{FIGURE 6: Streak overlay – 7-day volumes with grey bar beneath}}

The shaded band marks every day CAHOOTS handled a majority of early-window calls; the longest uninterrupted run spans mid-2017 through late-2023.

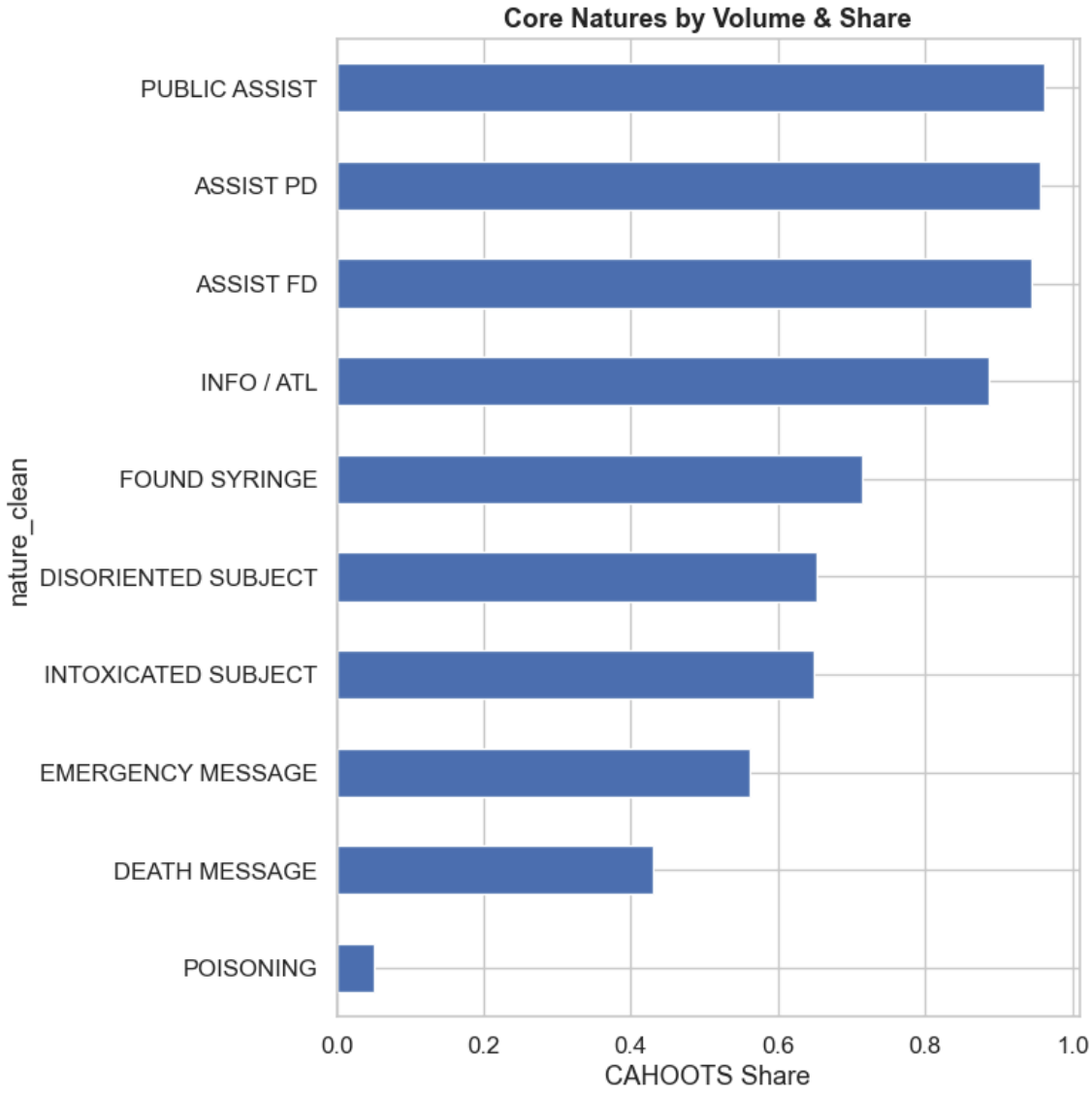


3.9 Incident-Type Patterns

3.9.1 Most Common Core Natures

{{FIGURE 7: Horizontal bar – CAHOOTS share for ten lowest-volume core natures}}

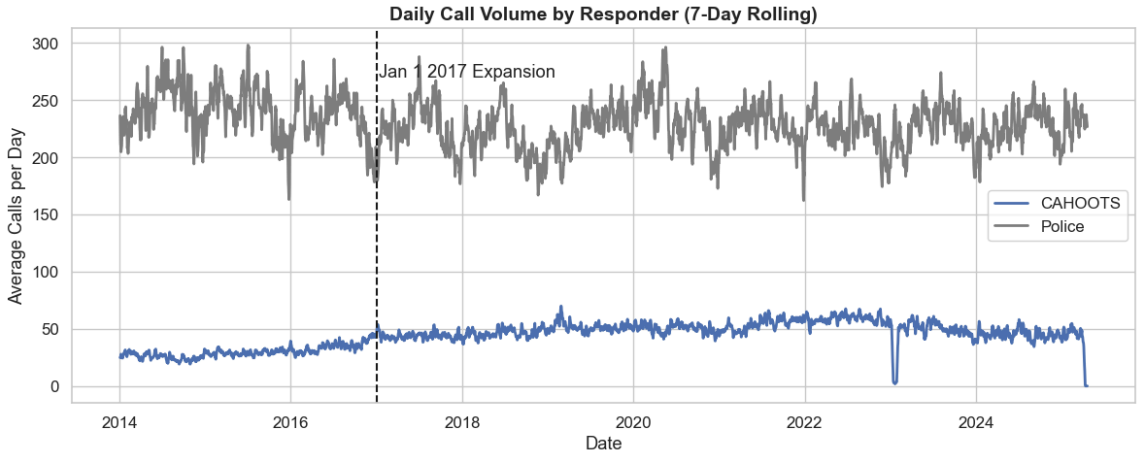
- **Public Assist**, **Assist PD**, and **Info/ATL** show CAHOOTS shares above 85 %, while **Poisoning** remains almost entirely police-handled.



3.9.2 Daily CAHOOTS vs Police Volume (7-day mean)

{{FIGURE 8: Smoothed daily volume with expansion date annotation}}

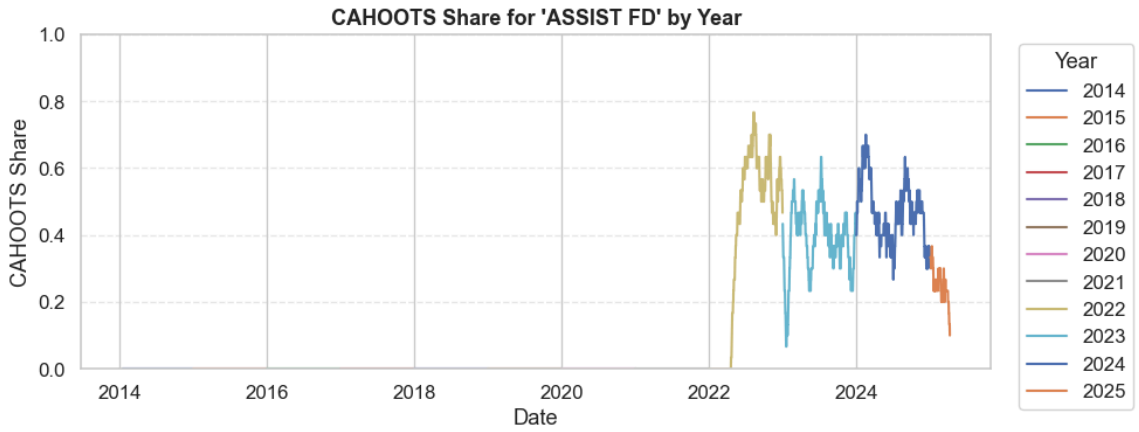
The vertical dashed line confirms a step-change in CAHOOTS load on the expansion date with no corresponding rise for police.

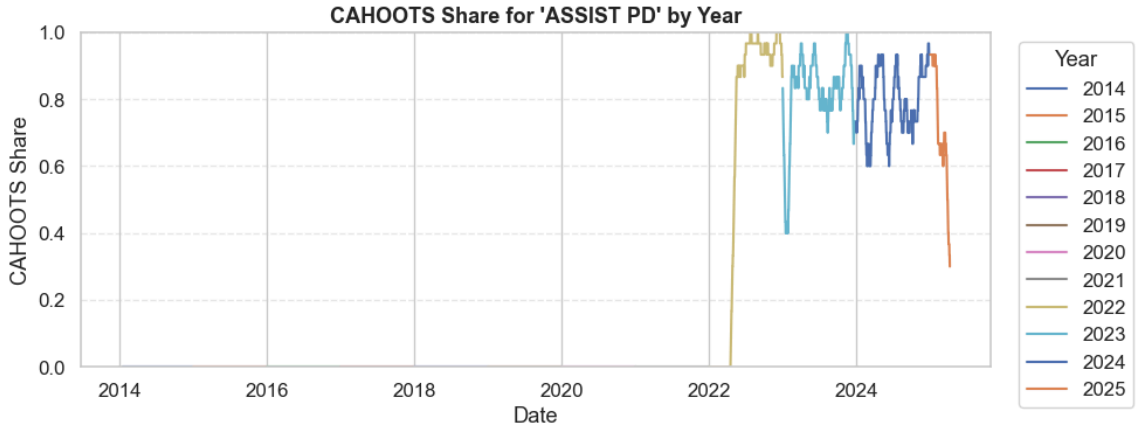


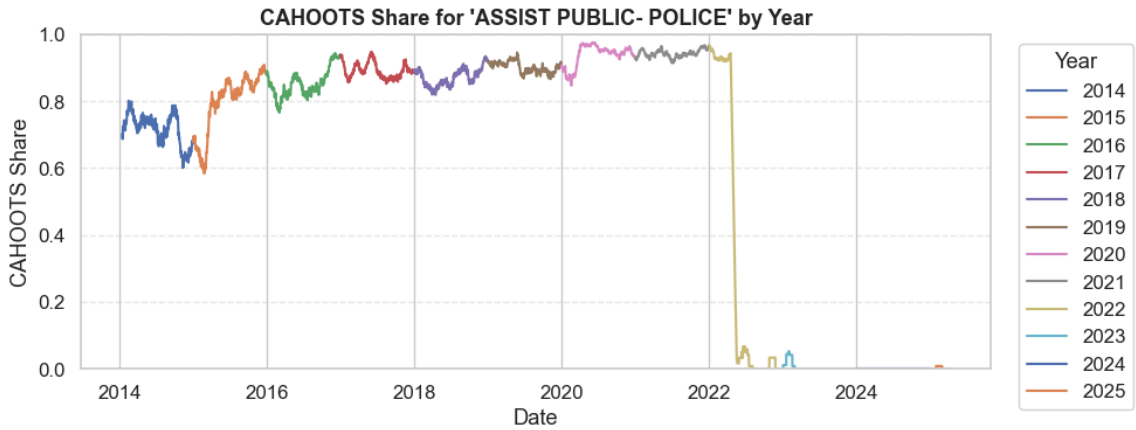
3.9.3 CAHOOTS Share by Nature over Time

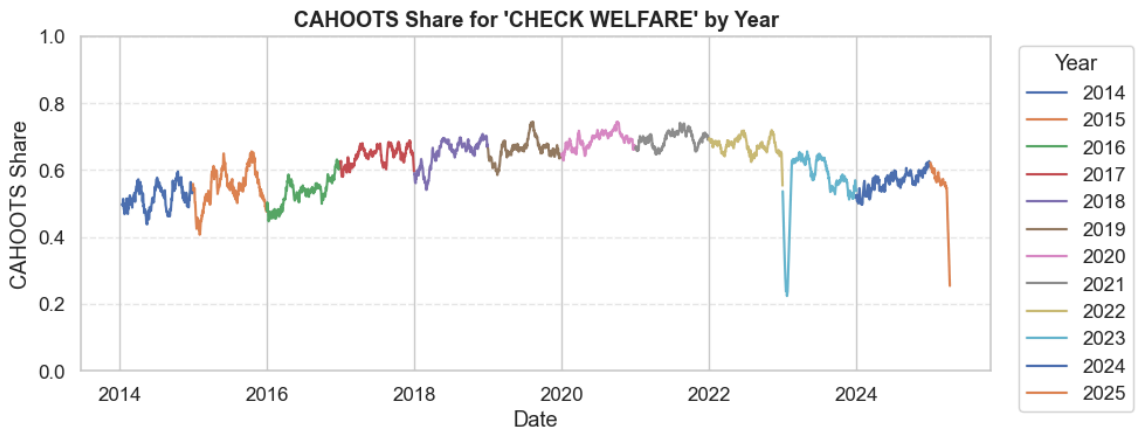
{{FIGURE 9a–9r: Line plots – one per nature, coloured by year}}

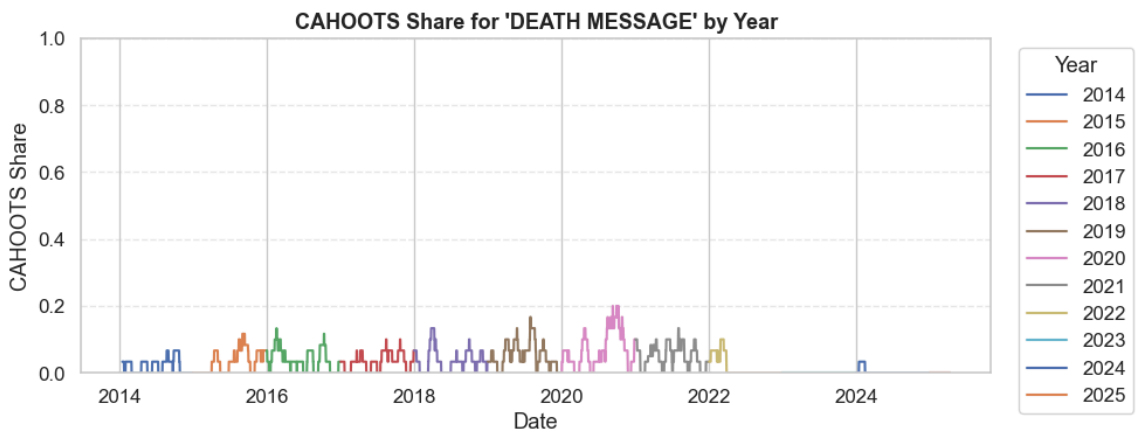
Within each incident type, post-2017 years cluster high on the vertical axis, reinforcing the system-wide diversion picture.

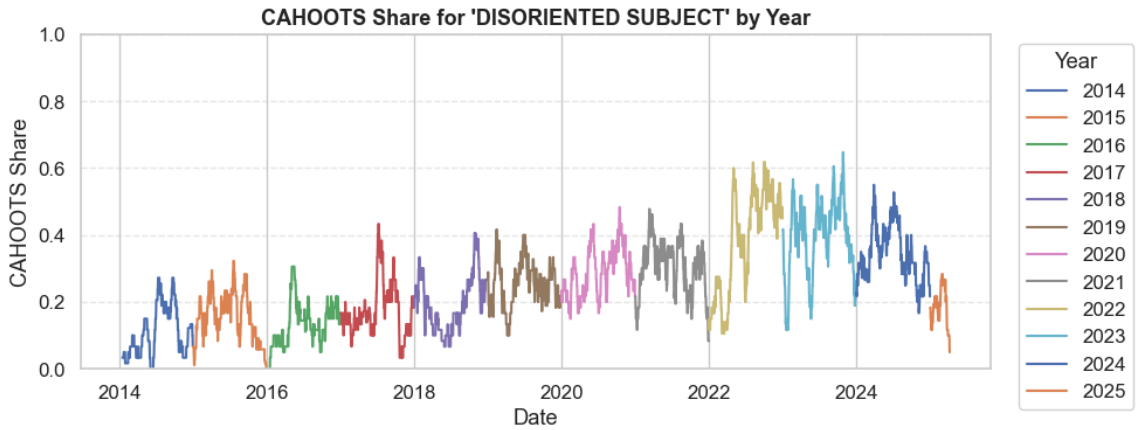





CAHOOTS Share for 'ASSIST PUBLIC- POLICE' by Year
CAHOOTS Share
Date
Year
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025


CAHOOTS Share for 'CHECK WELFARE' by Year
CAHOOTS Share
Date
Year
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025


CAHOOTS Share for 'DEATH MESSAGE' by Year
CAHOOTS Share
Date
Year
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025


CAHOOTS Share for 'DISORIENTED SUBJECT' by Year
CAHOOTS Share
Date
Year
2014
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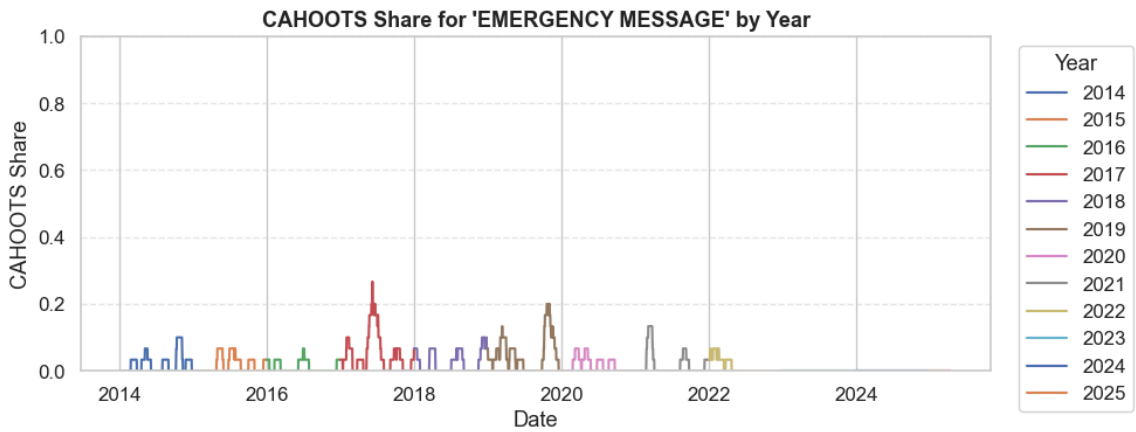
2023
2024
2025


CAHOOTS Share for 'EMERGENCY MESSAGE' by Year
CAHOOTS Share
Date
Year
2014
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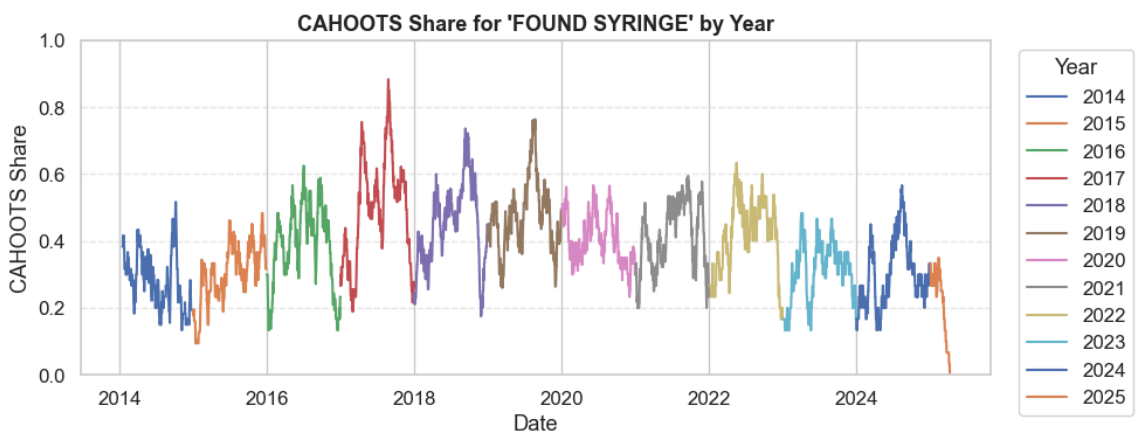
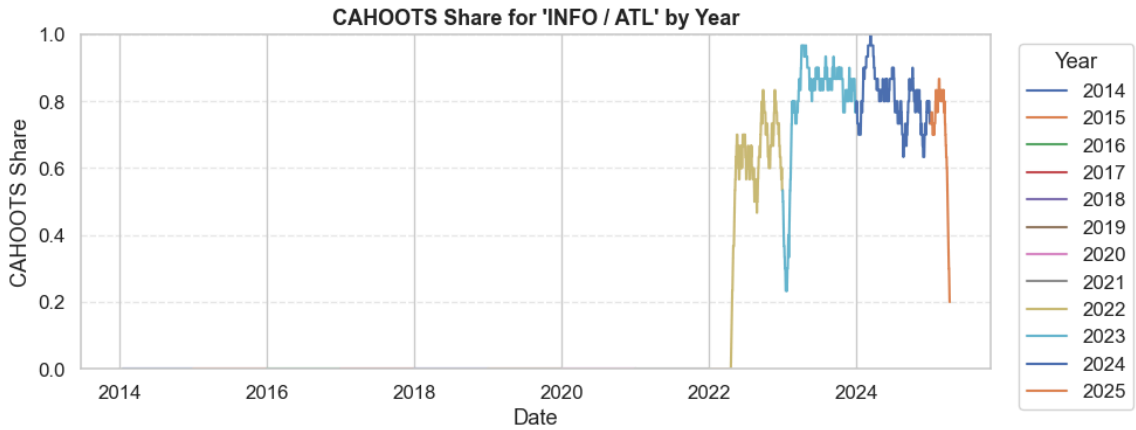
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025


CAHOOTS Share for 'FOUND SYRINGE' by Year
CAHOOTS Share
Date
Year
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025


CAHOOTS Share for 'INFO / ATL' by Year
CAHOOTS Share
Date
Year
2014
2015
2016
2017
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2021
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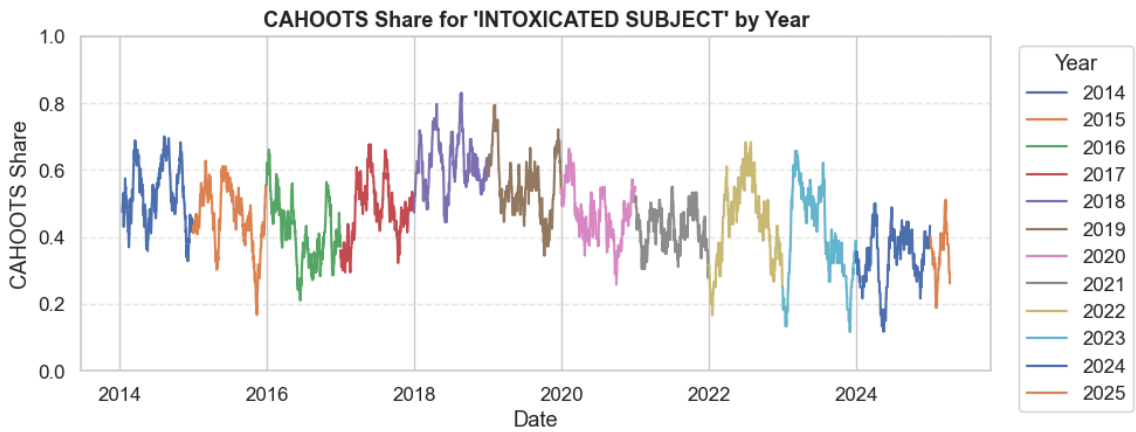
2025


CAHOOTS Share for 'INTOXICATED SUBJECT' by Year
CAHOOTS Share
Date
Year
2014
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2016
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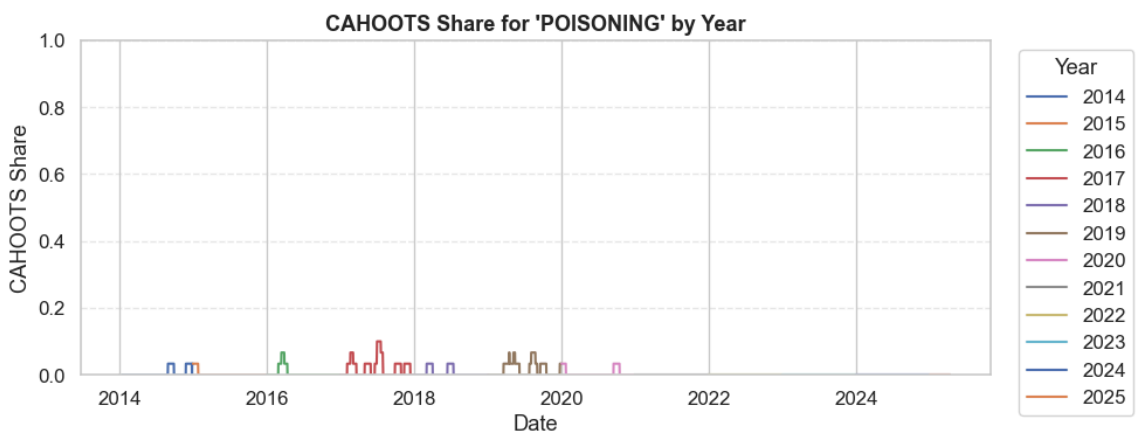
2019
2020
2021
2022
2023
2024
2025


CAHOOTS Share for 'POISONING' by Year
CAHOOTS Share
Date
Year
2014
2015
2016
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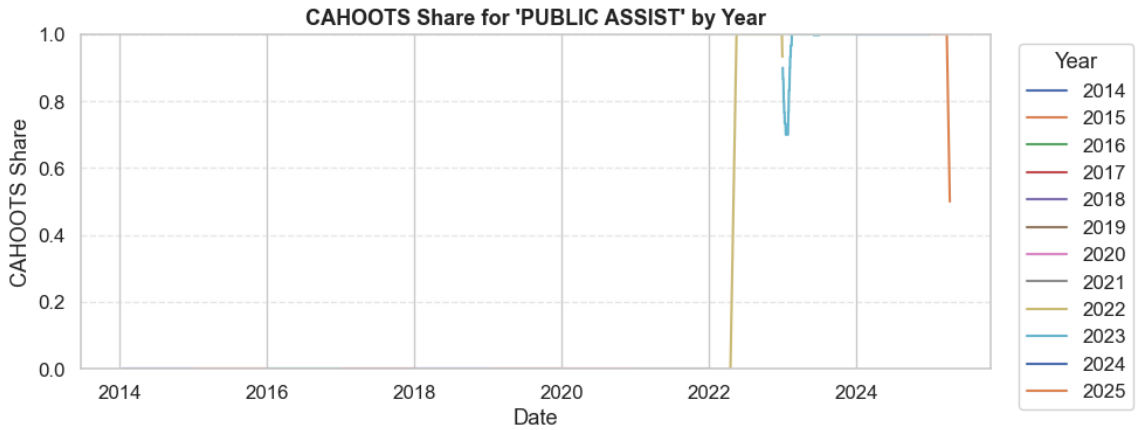
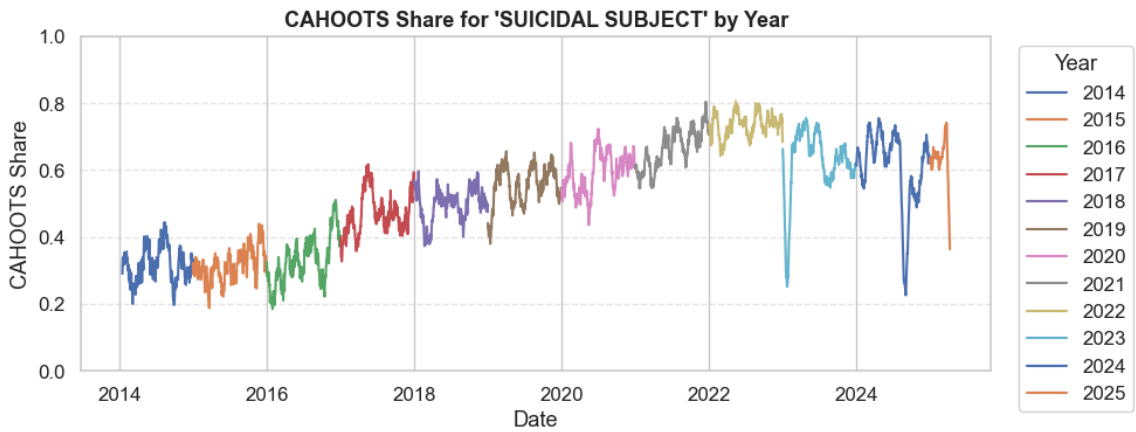
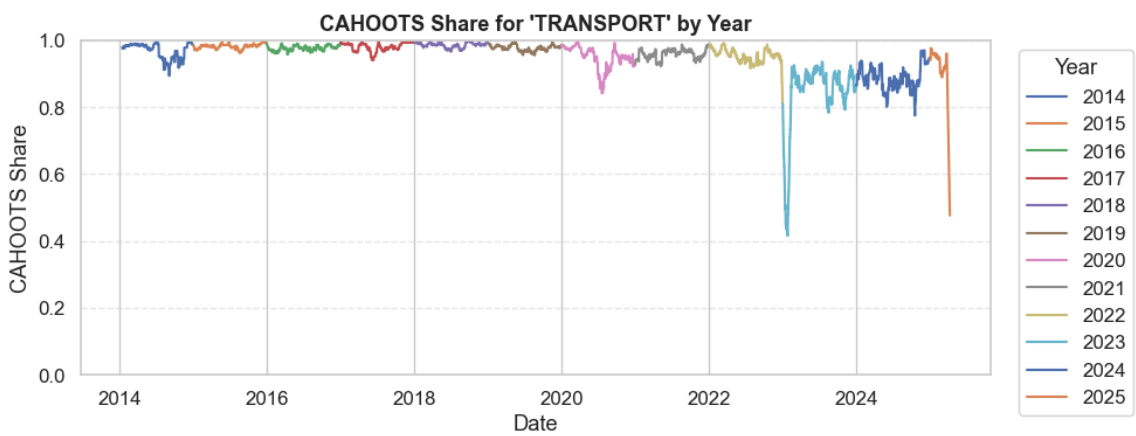
2019
2020
2021
2022
2023
2024
2025





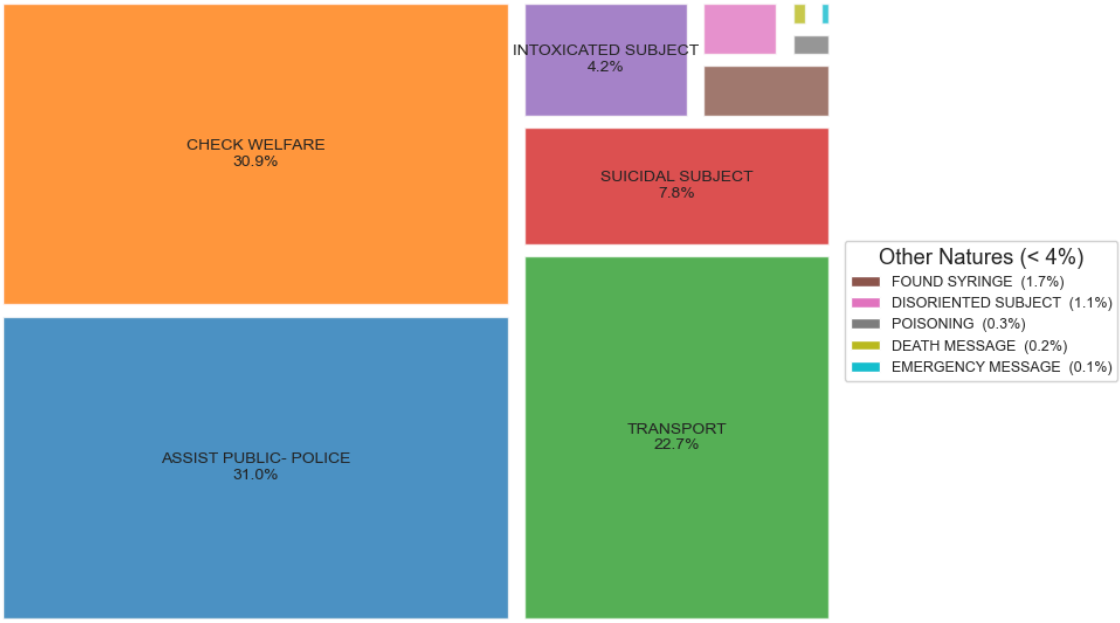


3.9.4 Annual Mix of Core Natures

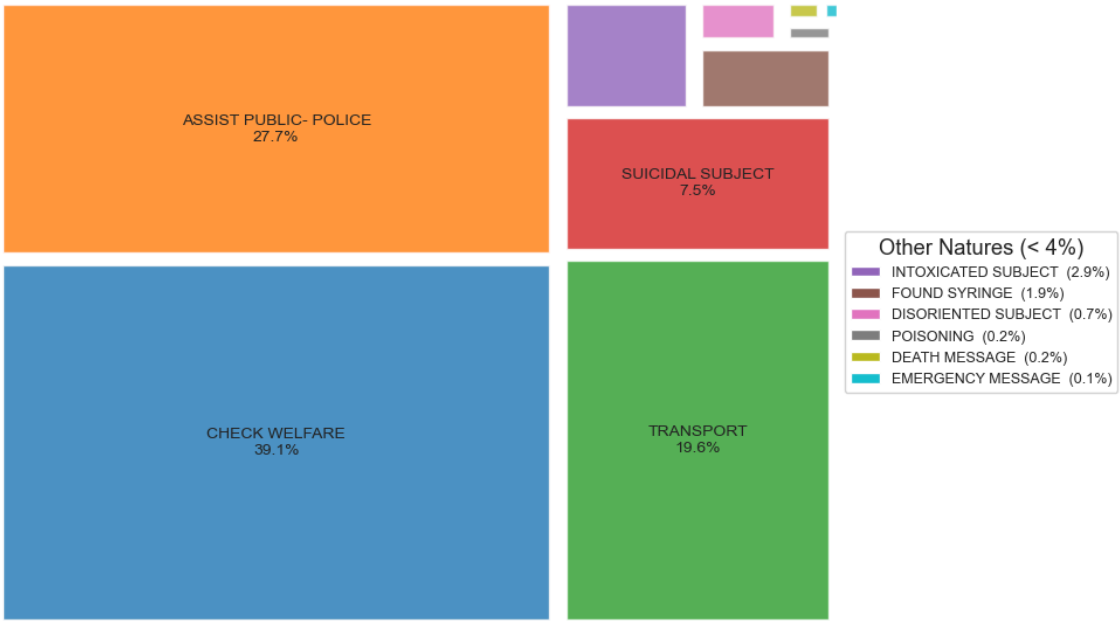
Rreemaps {{FIGURE 11a–11l}} show the composition of CAHOOTS-dominant calls each year. Although **Public Assist** and **Welfare Check** dominate volume, smaller categories (e.g., **Disoriented Subject**) gain share over time, hinting at evolving dispatch triage.

Core CAHOOTS Natures – 2014

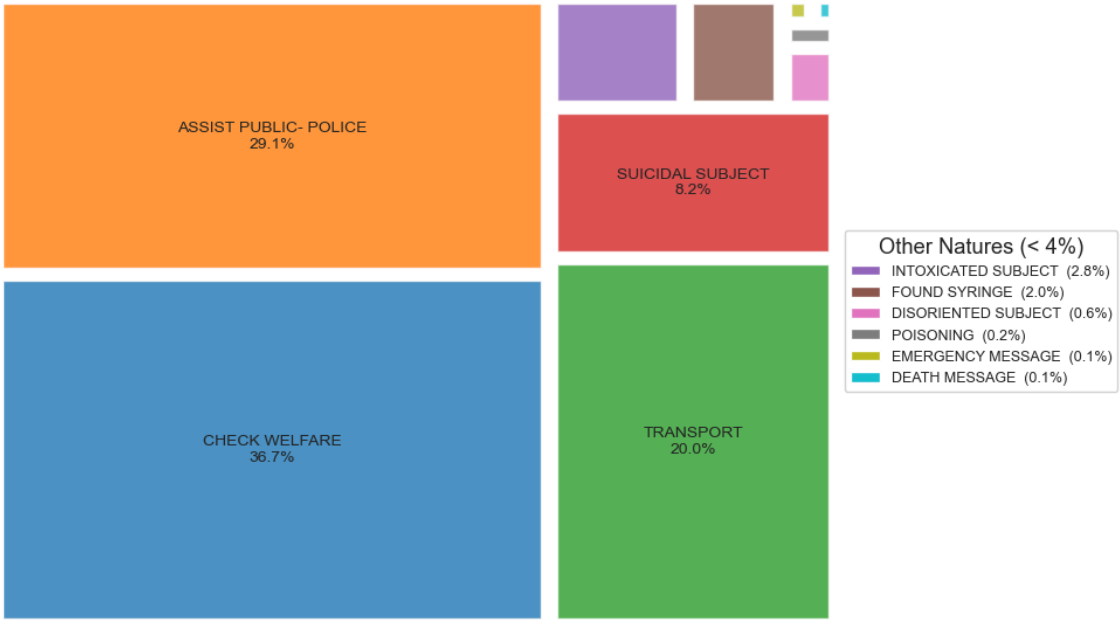
Core CAHOOTS Natures – 2015



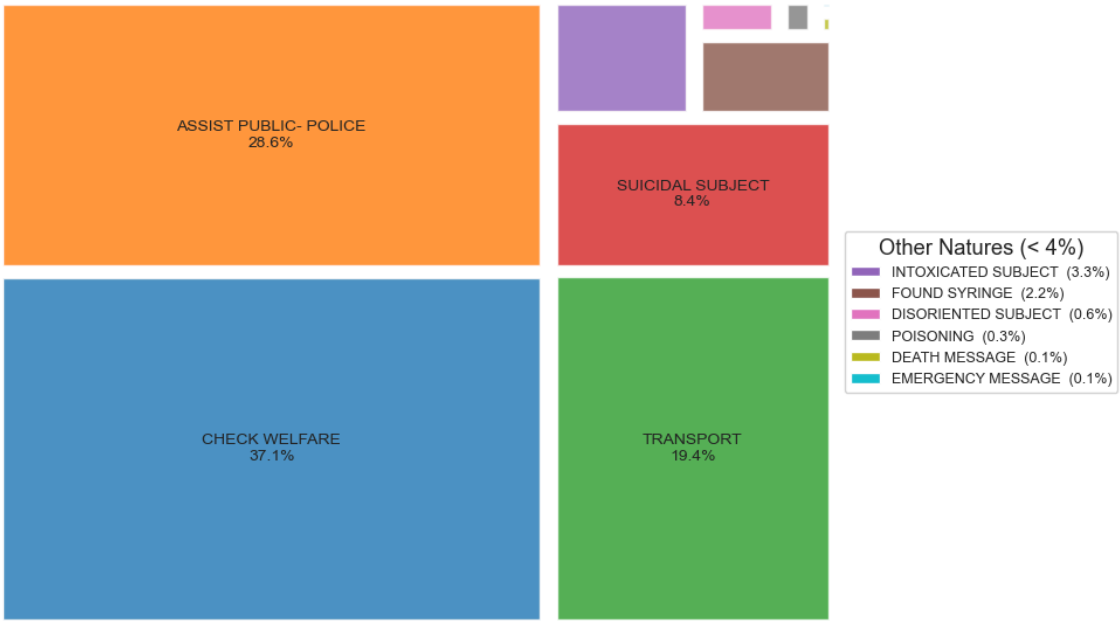
Core CAHOOTS Natures – 2016



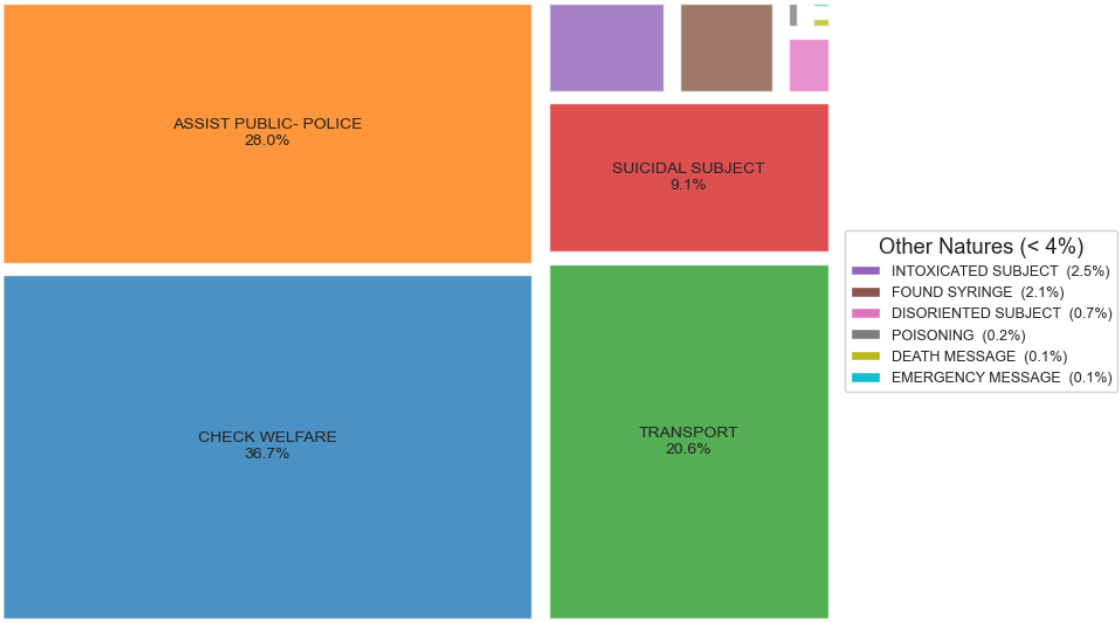
Core CAHOOTS Natures – 2017



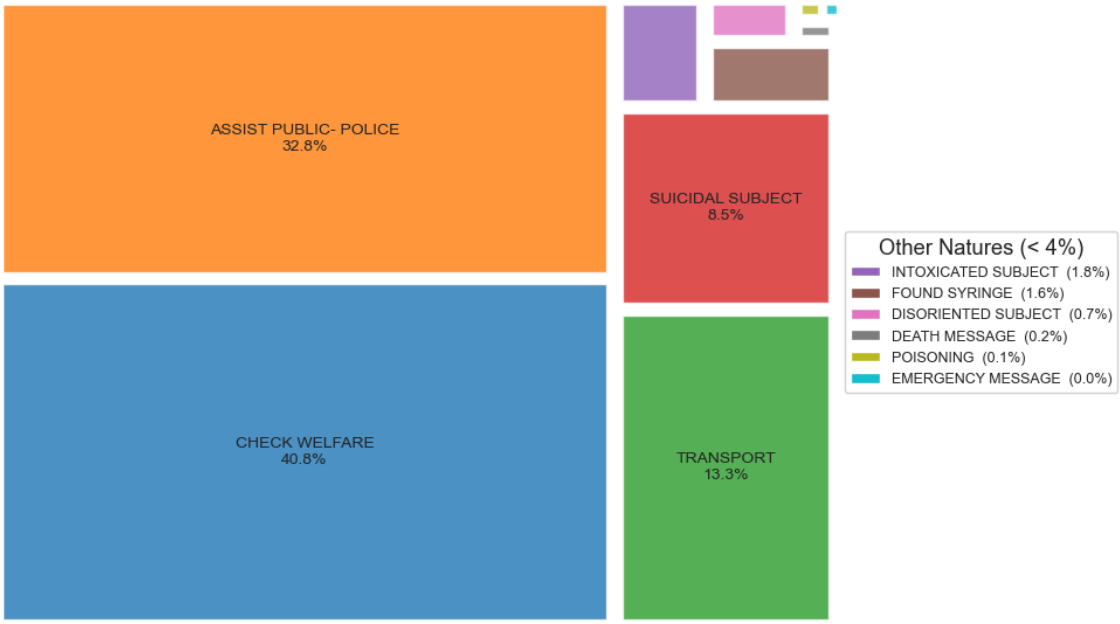
Core CAHOOTS Natures – 2018



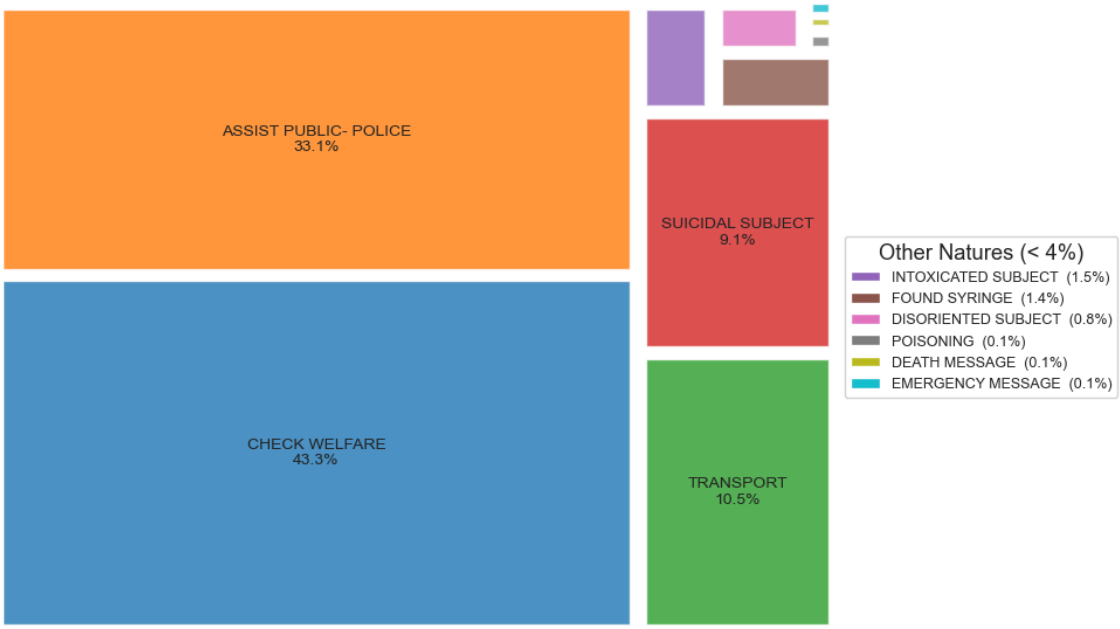
Core CAHOOTS Natures – 2019



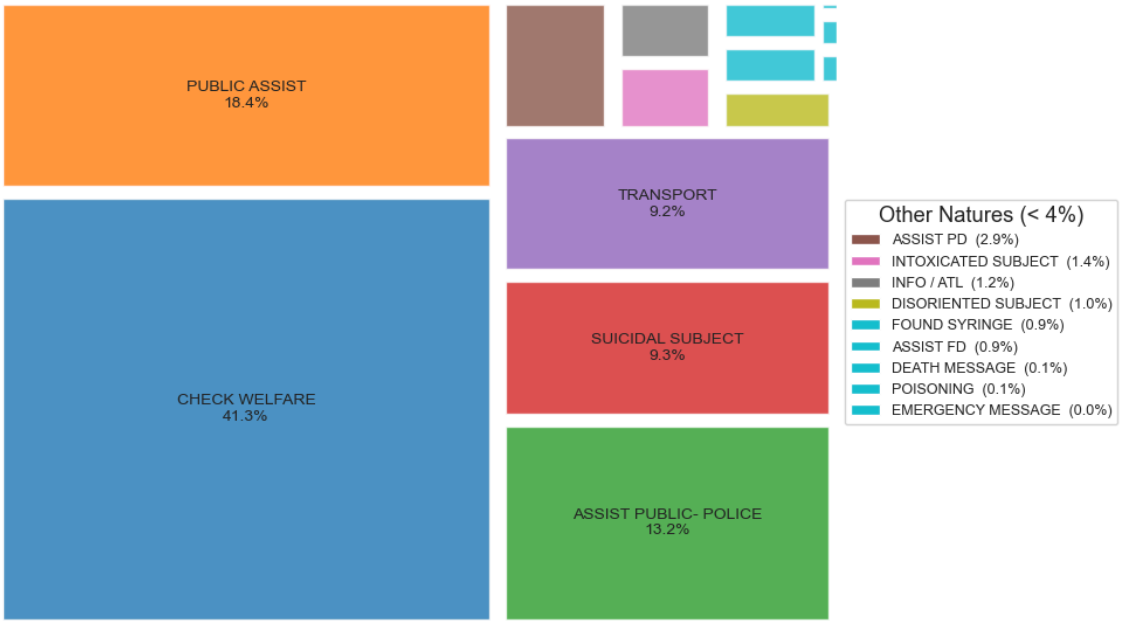
Core CAHOOTS Natures – 2020



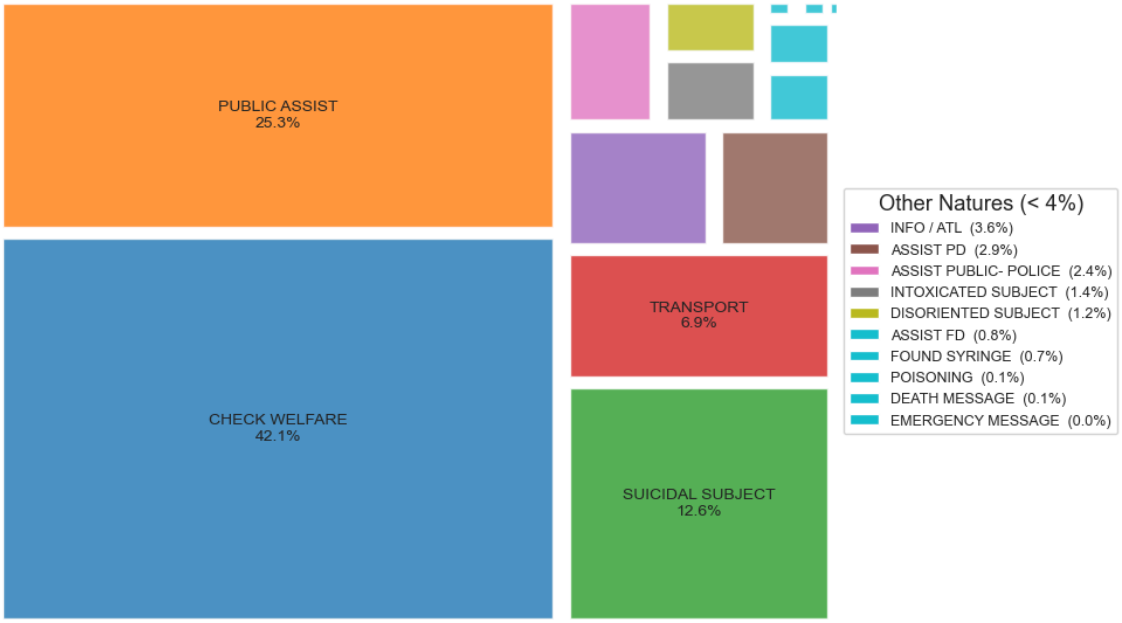
Core CAHOOTS Natures – 2021

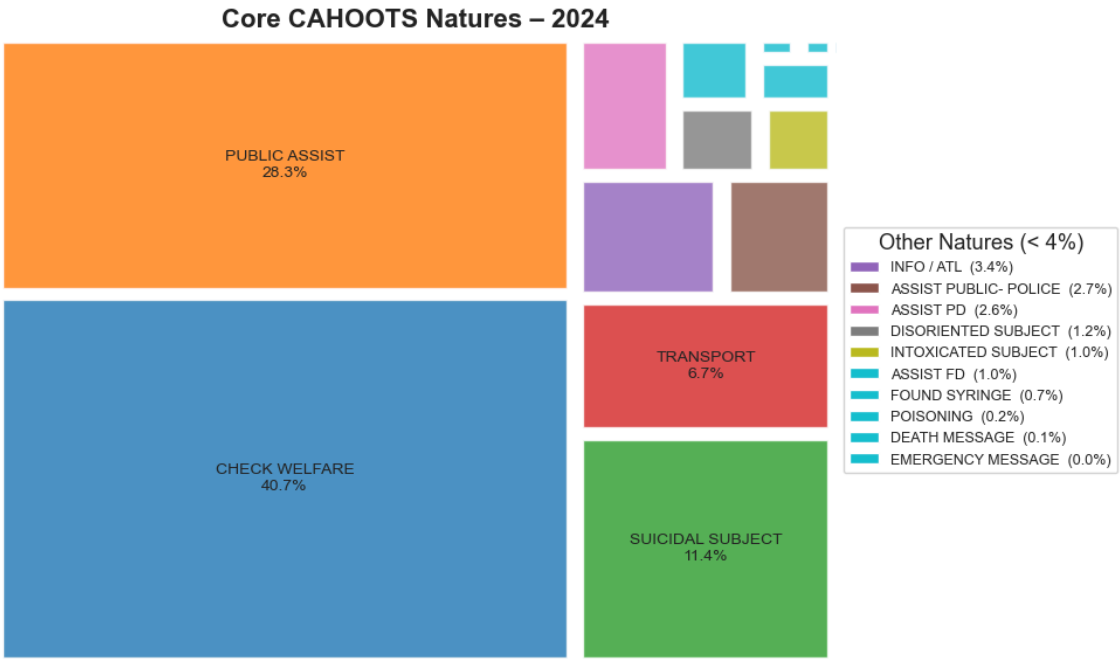


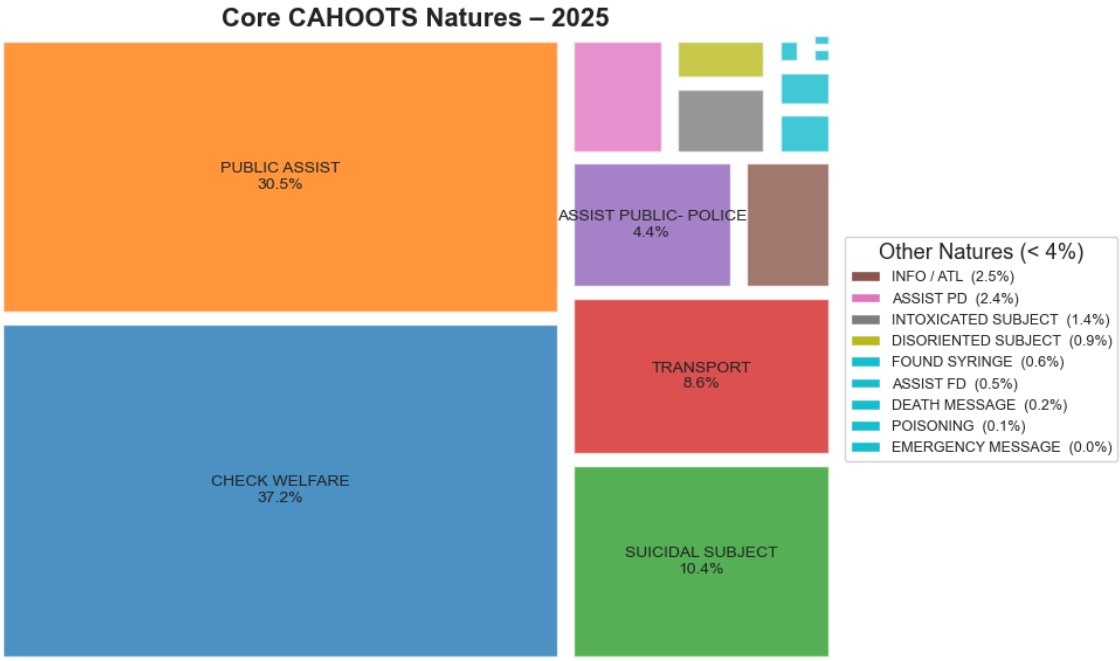
Core CAHOOTS Natures – 2022



Core CAHOOTS Natures – 2023







3.10 Key Visual Insights

- **Capacity expansion drove a persistent jump** in CAHOOTS share-from ≈ 30 % to ≈ 83 %—within the target 03 – 10 am window.
- **Police workload remained flat**, indicating substitution rather than new demand.
- **Long multi-year dominance streaks** suggest that once CAHOOTS captured a majority of early-window calls, it maintained that position.
- **Incident mix is stable but gradually broadening**, with CAHOOTS taking on a higher fraction of previously police-led categories.

Discussion

4.1 Summary of Main Findings

- **Capacity matters.** Adding a second CAHOOTS van and shifting the start time to 5 AM produced an immediate and persistent jump in CAHOOTS' share of early-morning (03:00 – 10:00) calls-from roughly one-quarter to well above four-fifths.
- **Diversion, not demand inflation.** Police call counts stayed flat while CAHOOTS counts rose, indicating that the extra van diverted workload rather than generating new calls or reducing overall demand.
- **Sustained dominance.** Once CAHOOTS crossed the 50 % threshold in the early window, it maintained that majority for multi-year stretches (longest uninterrupted run ≈ 2,263 days).
- **Incident mix broad but stable.** "Public Assist," "Welfare Check," and "Assist PD" remain the core of the CAHOOTS caseload, yet smaller categories such as "Disoriented Subject" and "Intoxicated Subject" grew steadily after 2017, implying increased dispatcher confidence in routing diverse low-acuity crises to CAHOOTS.

4.2 Interpreting the Results in Light of the Research Questions

Research Question	Evidence from Results
RQ: *How did the proportions of calls diverted to CAHOOTS vs. police change over time?*	Figure 1 and the yearly 7-day means show a step-change in diversion share at the 2017 expansion, followed by stable dominance through 2024.
RQ: *Within the 03:00 – 10:00 window, how did overall call volume and diversion proportions change?*	Figure 3 and Table 3.7 demonstrate that CAHOOTS' mean share rose from ~23 % to ~75 %, while total early-window call counts remained steady-indicating that police workload shifted rather than diminished.

Together, these visuals support the conclusion that a relatively small operational change (one extra van plus five additional service hours) yielded a durable re-allocation of crisis-response resources.

4.3 Caveats and Limitations

Category	Limitation	Potential Impact
Data coverage	~24 % of calls lacked an identifiable first responder and were dropped.	True CAHOOTS share could be slightly higher or lower.
Incident selection	Analysis focuses on 18 "CAHOOTS-dominant" natures.	Trends in rarely routed or high-acuity incidents are not captured.
Threshold choice	50.1 % cutoff for "dominant" days is arbitrary.	Streak counts and lengths would shift under stricter or looser rules.

Category	Limitation	Potential Impact
No outcome metrics	CAD logs include neither patient outcomes nor scene resolution times.	The study speaks only to diversion volume, not to service quality or effectiveness.
External factors	Pandemic (2020–21) and policy changes may confound trends.	Some share changes could reflect broader societal shifts rather than capacity alone.
Descriptive only	No formal hypothesis tests or control city.	Causal claims remain provisional; visuals suggest but do not prove causation.

4.4 Opportunities for Future Work

- **Formal causal inference.** A difference-in-differences design with a matched comparison city or synthetic control would strengthen causal claims.
- **Quality-of-service metrics.** Linking CAD records to medical-outcome or survey data would illuminate whether diversion yields better client results.
- **Operational resilience.** Exploring staffing logs could explain fluctuations in CAHOOTS share after 2023 and guide contingency planning.
- **Fine-grained temporal modelling.** A point-process or time-series model could forecast call volumes and optimise shift scheduling beyond the 7-day rolling means used here.

Overall, the visual evidence strongly supports the view that modest investments in community-based crisis response can meaningfully reduce routine police workload without suppressing overall demand for assistance.