# Question 1

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# Question 1

- Is there evidence that traffic stops disproportionately target men?
- Are certain cities/locations “balanced” in terms of how traffic stops reflect the demography of that city/location?

## Setup

- **Techniques:**
  - **Proportion calculation**: For each state, we computed the proportion of traffic stops attributed to a particular group (e.g., male drivers or stops per state), and compared it to the corresponding group's share of the licensed driver population.
  - **Spatial visualization (Choropleth map)**: We used spatial visualizations to map the differences between stop and license proportions across states. This allowed for quick identification of geographic patterns in over- or under-representation.

- **Techniques**:
  - **Cohen's h (Effect Size)**: statistically measure the difference between two proportions, independent of sample size.
    $h = 2 \cdot \arcsin(\sqrt{p_1}) - 2 \cdot \arcsin(\sqrt{p_2})$
    - Interpretation Thresholds

| Cohen's *h* Range | Interpretation |
|---|---|
| h < 0.20 | Negligible difference |
| 0.20 < h < 0.50 | Small effect |
| 0.50 < h < 0.80 | Medium effect |
| h > 0.80 | Large effect |

- **Workflow**
  - **Datascope**: Focused on overlapping time period (2014–2015) across major U.S. states. For each year, calculate the proportions(male stops, male drivers; licensed drivers proportion in the whole US for each state, stop proportion of the whole US for each state)
  - **Visualization**: Generate choropleth maps to visualize geographic differences in stop vs. license proportions.
  - **Cohen's h**: to statistically measure the difference

## Results

Is there evidence that traffic stops disproportionately target men?

- Whole US
  - Male_stop_proportion = 66.534%
  - Male_licensed_driver_proportion = 49.415%
  - Cohen_h = 0.34852
  - Result: Mildly overstop Male drivers

- State level
  - All states show positive gaps → more men are stopped than expected.
  - Similar pattern for both years.

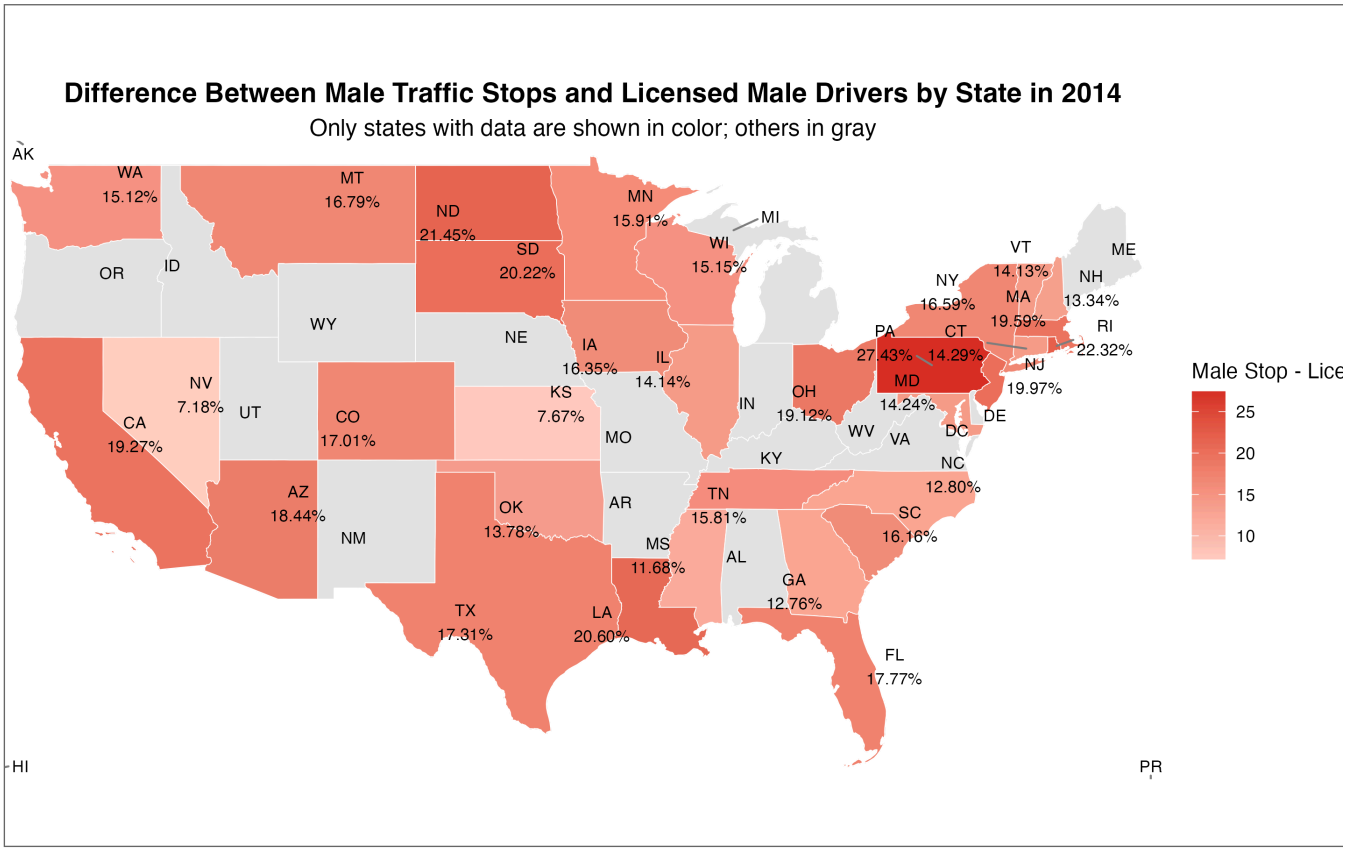


Figure 1: Difference Between Male Traffic Stops & Licensed Male Drivers by state in 2014

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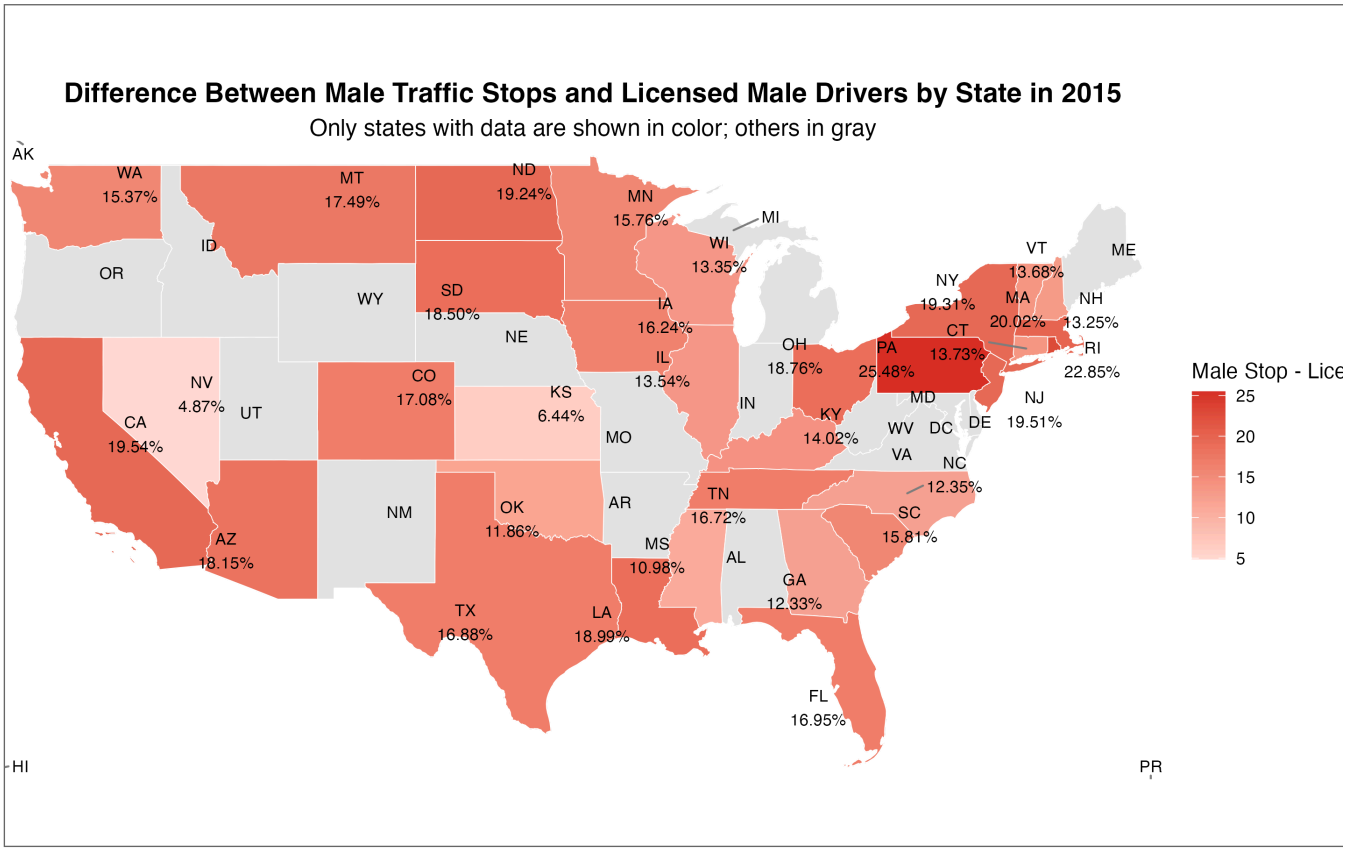


Figure 2: Difference Between Male Traffic Stops & Licensed Male Drivers by state in 2015

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- Cohen’s h Results

Show 32 entries Search:

Interactive Comparison of Stop vs. Driver Proportions (Male, 2014)

| | state | year | cohens_h | h_interpretation |
|---|---|---|---|---|
| 1 | AZ | 2014 | 0.378118266326143 | Mildly Overstop Male |
| 2 | CA | 2014 | 0.396735370161457 | Mildly Overstop Male |
| 3 | CO | 2014 | 0.348712730804358 | Mildly Overstop Male |
| 4 | CT | 2014 | 0.289286880180441 | Mildly Overstop Male |
| 5 | FL | 2014 | 0.361957886166687 | Mildly Overstop Male |
| 6 | GA | 2014 | 0.256660485430988 | Mildly Overstop Male |
| 7 | IA | 2014 | 0.332586599859812 | Mildly Overstop Male |
| 8 | IL | 2014 | 0.286056855880685 | Mildly Overstop Male |

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- Cohen's h Results

Show 32 entries Search:

Interactive Comparison of Stop vs. Driver Proportions (Male, 2015)

| | state | year | cohens_h | h_interpretation |
|---|---|---|---|---|
| 1 | AZ | 2015 | 0.371887360676334 | Mildly Overstop Male |
| 2 | CA | 2015 | 0.402928793531023 | Mildly Overstop Male |
| 3 | CO | 2015 | 0.350364258971463 | Mildly Overstop Male |
| 4 | CT | 2015 | 0.27769434825053 | Mildly Overstop Male |
| 5 | FL | 2015 | 0.34467550792416 | Mildly Overstop Male |
| 6 | GA | 2015 | 0.247978714898403 | Mildly Overstop Male |
| 7 | IA | 2015 | 0.330224724401672 | Mildly Overstop Male |
| 8 | IL | 2015 | 0.273703245144065 | Mildly Overstop Male |

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Key Takeaways

- **Nationwide Trend:** Most states, as well as the U.S. overall, show **mild overrepresentation of male drivers** in traffic stops compared to their share of licensed drivers.
- **Balanced States:** Only **Nevada (NV)** and **Kansas (KS)** show **gender-balanced enforcement**, with male stop rates aligning closely with male driver proportions.
- **High Overstop State: Pennsylvania (PA)** exhibits a **notably higher overstop rate** for male drivers.

Real-world Takeaways

- **Operational Patterns:** The mild overstop of male drivers may be linked to **driving behavior patterns**

## Results Cont.

Are certain cities/locations “balanced” in terms of how traffic stops reflect the demography of that city/location?

- Datascope: 2014-2015
- 39 states
- 3 states did not have any overlap with other major states
- Choropleth maps show the difference between stop and license proportions by state in 2014 and 2015.
- Red indicates more stops than expected, blue indicates fewer stops than expected, white/gray denotes minimal difference.

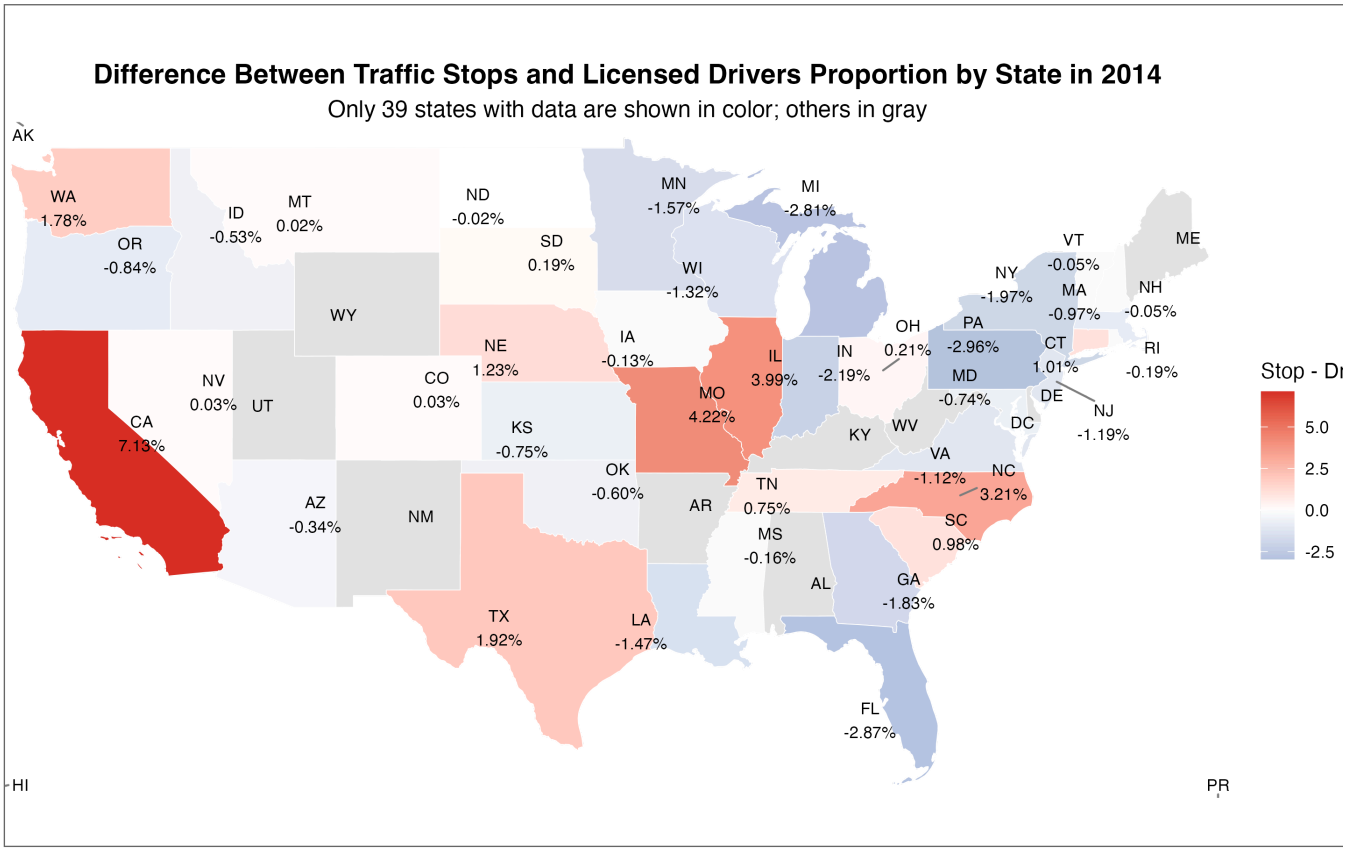


Figure 3: Differences between Traffic Stops & Licensed Drivers Proportion by State in 2014

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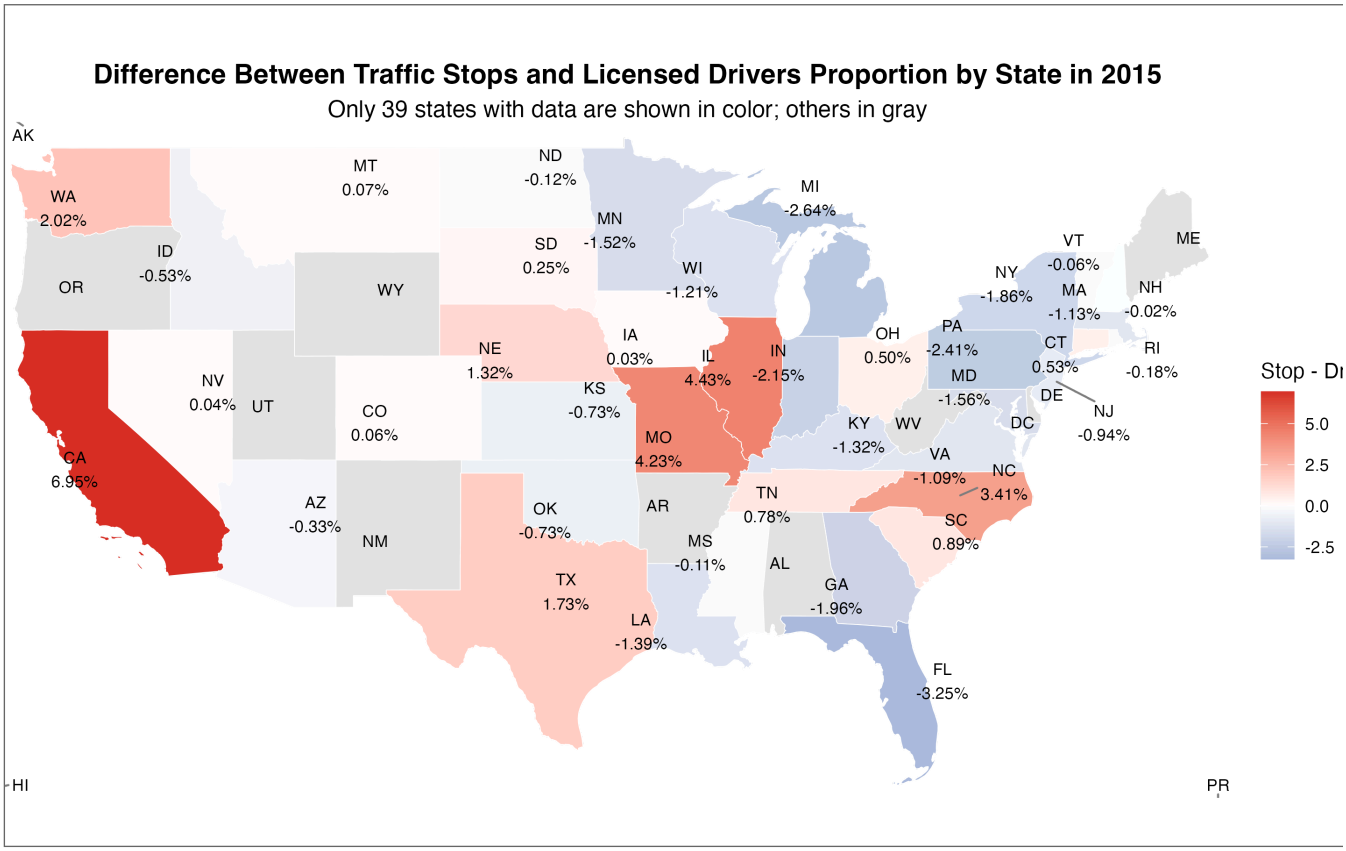


Figure 4: Differences between Traffic Stops & Licensed Drivers Proportion by State in 2015

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- Consistently **Under-Policed States** (fewer stops than expected in both years):
  - Pennsylvania(PA)
  - Florida(FL)
  - Michigan(MI)
  - Indiana(IN)
- Consistently **Over-Policed States** (more stops than expected in both years):
  - California(CA)
  - Illinois(IL)
  - Missouri(MO)
  - North Carolina(NC)

Show 39 entries Search:

Interactive Comparison of Stop vs. Licensed drivers (2014)

| | state | year | cohens_h | h_interpretation |
|---|---|---|---|---|
| 1 | CA | 2014 | 0.194825278429147 | Balanced |
| 2 | TX | 2014 | 0.0675221413521493 | Balanced |
| 3 | IL | 2014 | 0.167011563944956 | Balanced |
| 4 | NC | 2014 | 0.146666268809352 | Balanced |
| 5 | MO | 2014 | 0.215142968124892 | Mildly Imbalanced |
| 6 | WA | 2014 | 0.09588631837475 | Balanced |
| 7 | OH | 2014 | 0.0105606066955476 | Balanced |
| 8 | FL | 2014 | -0.125678486029976 | Balanced |
| 9 | NY | 2014 | -0.0930604684648567 | Balanced |
| 10 | TN | 2014 | 0.0462570571584977 | Balanced |
| 11 | SC | 2014 | 0.0653238850445049 | Balanced |
| 12 | CT | 2014 | 0.0768423487247888 | Balanced |

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Show 39 entries Search:

Interactive Comparison of Stop vs. Licensed drivers (2015)

| | state | year | cohens_h | h_interpretation |
|---|---|---|---|---|
| 1 | CA | 2015 | 0.189609343869892 | Balanced |
| 2 | TX | 2015 | 0.0611844885358523 | Balanced |
| 3 | IL | 2015 | 0.183247208229307 | Balanced |
| 4 | NC | 2015 | 0.154568054746269 | Balanced |
| 5 | MO | 2015 | 0.217804010856164 | Mildly Imbalanced |
| 6 | WA | 2015 | 0.107154208981375 | Balanced |
| 7 | OH | 2015 | 0.0249373296583805 | Balanced |
| 8 | NY | 2015 | -0.0865455146593562 | Balanced |
| 9 | FL | 2015 | -0.14431185919885 | Balanced |
| 10 | TN | 2015 | 0.04833588195685 | Balanced |
| 11 | SC | 2015 | 0.0598444465460021 | Balanced |
| 12 | AZ | 2015 | 0.0218581830705526 | Balanced |

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| State | 2014 | 2015 |
|---|---|---|
| Missouri(MO) | Mildly Imbalanced | Mildly Imbalanced |
| Michigan(MI) | Mildly Imbalanced | Balaneced |
| Indiana(IN) | Mildly Imbalanced | Mildly Imbalanced |

- **Most states are statistically balanced** in terms of traffic stop proportions vs. licensed driver proportions.
- **Only a few states** showed *mild imbalance* across both years, These imbalances are small in magnitude and may have limited real-world impact.
- **No strong evidence of systemic geographic bias** in traffic stops across states
- **Small imbalances may reflect local operational factors** (e.g., highway traffic, policing resource allocation)