

Improving SC Roads Using Insights from DoT Traffic Data: **Alive@25 Recommendations**

Students - Bharath Muppasani, Saina
Srivastava, Nitin Gupta, Aarohi Goel;
Advisors - Lucas Vasconcelos, Biplav Srivastava

South Carolina Department of Health and
Environmental Control, South Carolina
Department of Public Safety (SCDPS), National
Safety Council Southeastern Chapter (NSCSC)

Update Meeting: Friday, June 26, 2024



UNIVERSITY OF
South Carolina

Stakeholders

External

- Office of Injury and Violence Prevention within the Department of Health and Environmental Control (DHEC) – Emma Kennedy, Karilyn Tremblay and Kevin Poore
- National Safety Council Southeastern Chapter (NSCSC) – Melissa Reck, Todd Buehrig
- Office of Highway Safety and Justice Programs (OHSJP) within the South Carolina Department of Public Safety (SCDPS) – Ross Hartfield and others.

USC

- CEC - Nitin Gupta, **Bharath Muppasani**, Biplav Srivastava
- College of Education - Lucas Vasconcelos

Additional Students

- Saina Srivastava, Rising Undergrad, Duke Univ
- Aarohi Goel, Rising Sophomore, California

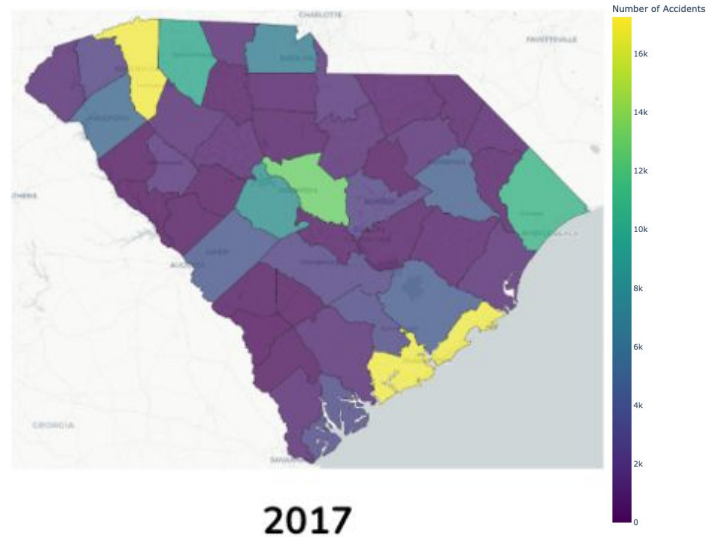
Data

Received 24 dataset files in total. (6 files for each dataset type)

- D1 - **LOC** - { 57 variables; ~42 MB; ~138,867 records }/file
 - Contains information about the collision under various conditions, including location, weather, road type, and contributing factors.
- D2 - **OCC** - { 17 variables - ~28 MB /file - ~350,237 records }/file
 - Provides details about individuals involved in the collision, such as demographics, seating position, injury status, and safety device usage.
- D3 - **TBD** - { 22 variables - ~600 KB /file - ~3,677 records }/file
 - Includes data on carriers involved in collisions, focusing on vehicle types, hazardous materials, and citations, with significant data missing for many variables.
- D4 - **UNT** - { 47 variables - ~58 MB /file - ~261,194 records }/file
 - Contains information about the vehicles involved in collisions, covering aspects like vehicle type, damage extent, speed, and occupant details.

Dataset Identifier	Datatype	Years Available
D1	LOC	2017 to 2022
D2	OCC	2017 to 2022
D3	TBD	2017 to 2022
D4	UNT	2017 to 2022

Traffic Analysis

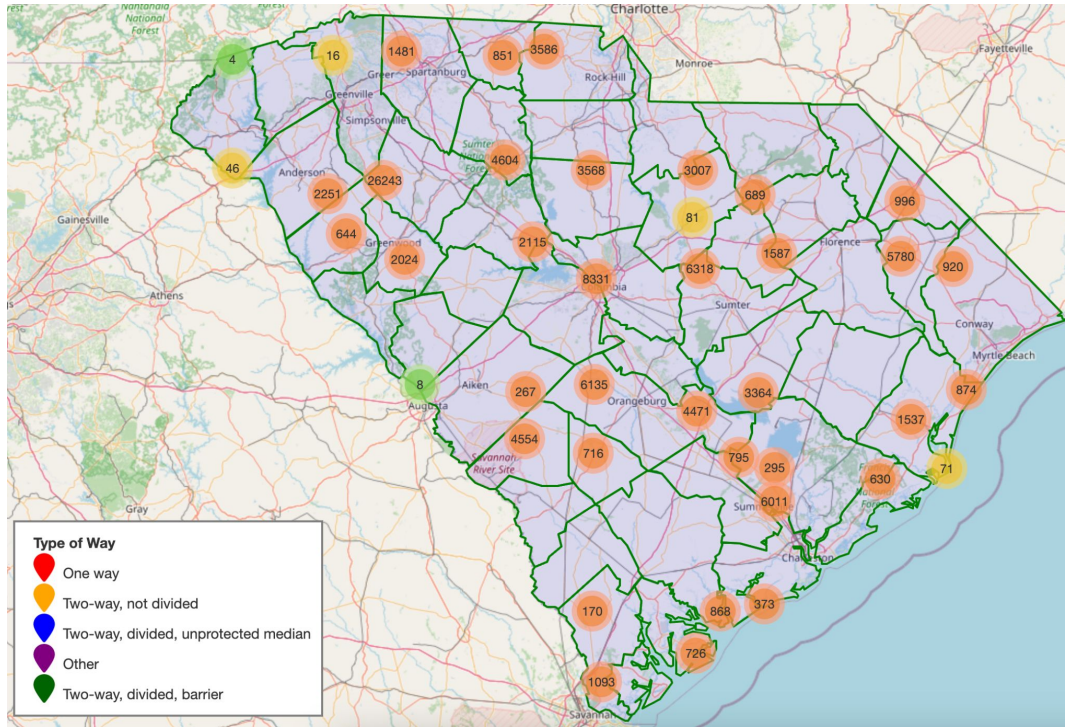


#accidents over the years, by counties

01.

Newer Insights

Collision Visualization With LAT and LON Coordinates



Incidents map plotted using *LAT* and *LON* coordinates recorded

Data Statistics - for 2021 data

Initial length of the data for the year 2021:

147,724

Percentage of rows filtered with lat=0 or lon=0:

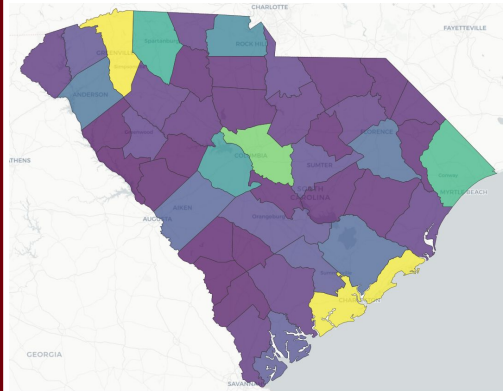
1.45%

Total reduction percentage (after state filtering):

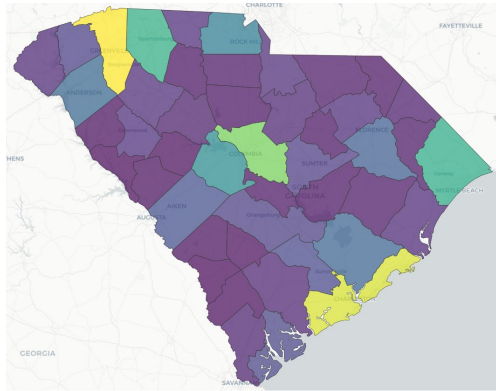
26.82%

Observation: Almost $\frac{1}{4}$ th of the dataset's LAT and LON coordinates for the collisions, when mapped, are falling out of South Carolina and out of the county's recorded for the collision

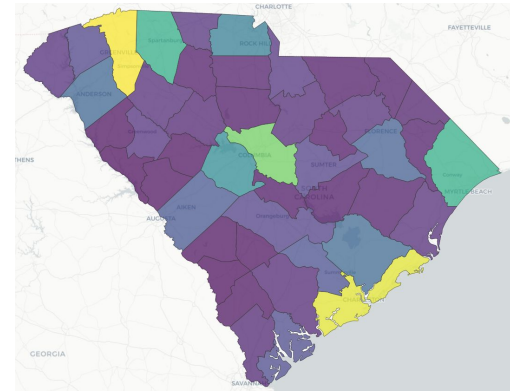
Higher number of collisions are observed in 'Greeneville', 'Charleston', and 'Richland' counties consistently across all the years - all of which are 'Urban' counties.



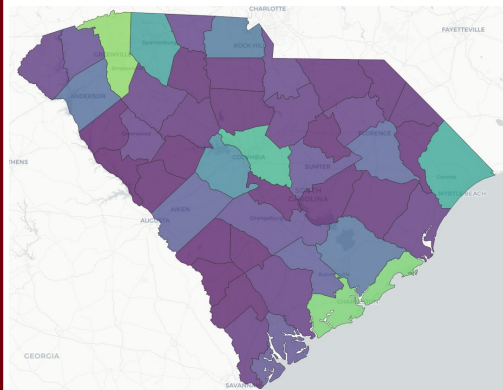
2017



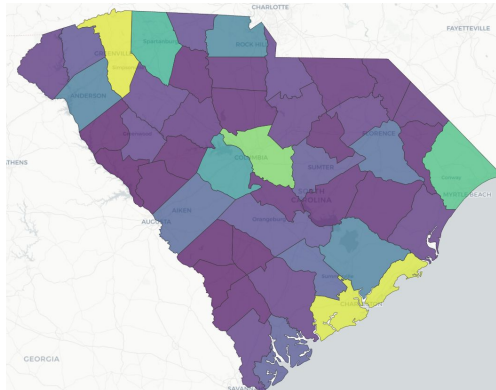
2018



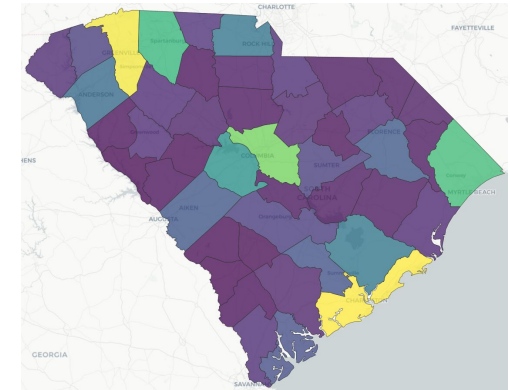
2019



2020

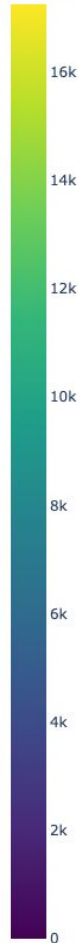


2021



2022

Number of Accidents



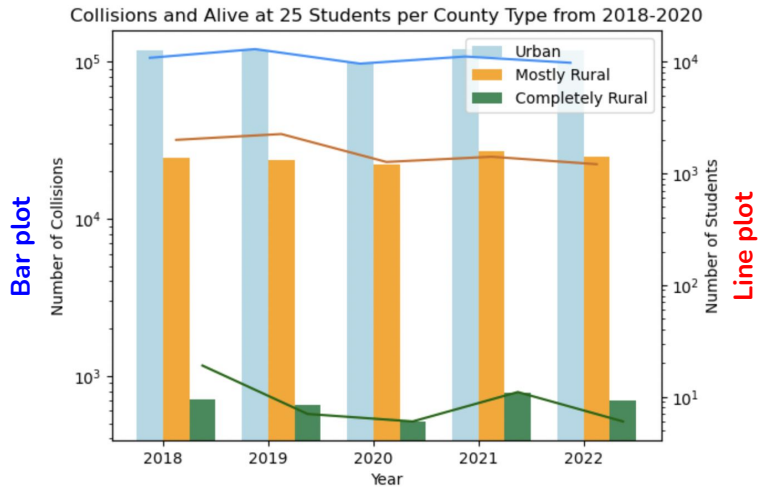
*work lead by Nitin Gupta

Interactive Map

<https://ai4society.github.io/Traffic-Data-Analysis/>

Category Specific Insights

- Source for county categories: Adapted from **Census Data from 2015**
- Source for Alive at 25 Students: Adapted from given A25 data
- County categories - **Urban, Mostly Rural, Rural**
- Higher number of collision incidents in urban counties



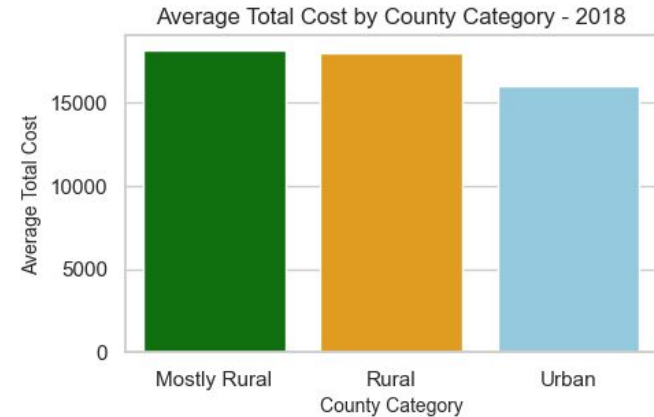
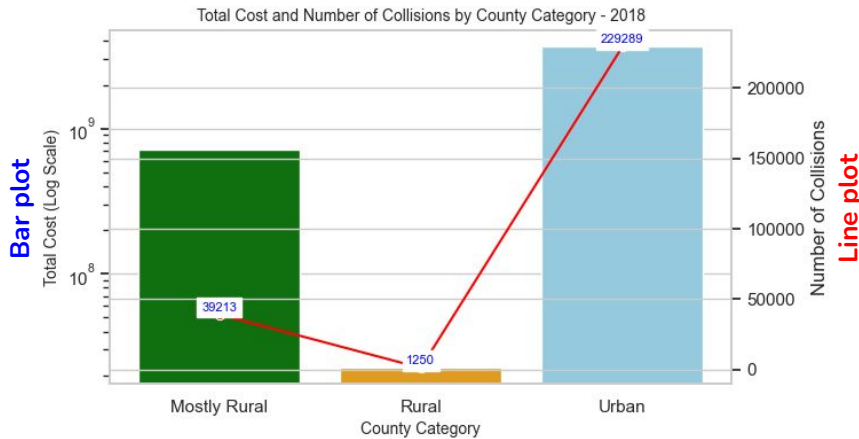
There is a decreasing trend in the number of participants in the Alive@25 program in mostly rural counties, while **there is an increasing trend in collisions in these areas.**

	Urban	Mostly Rural	Rural
# Counties	17	27	2

Cost of Injury + Unit Damages

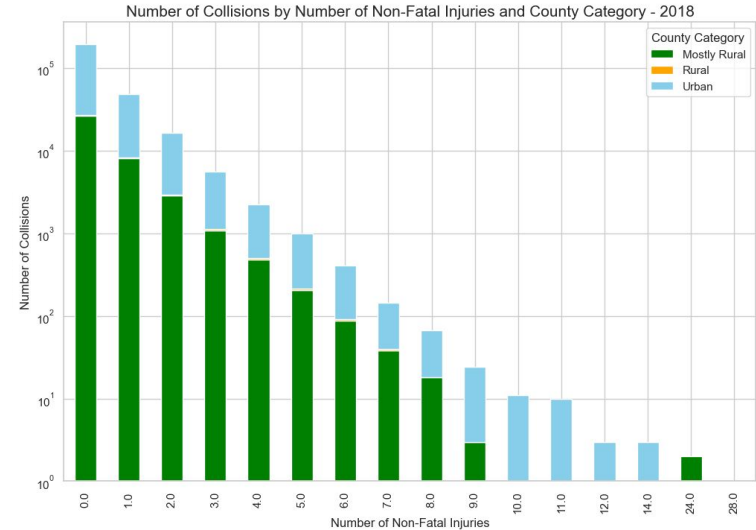
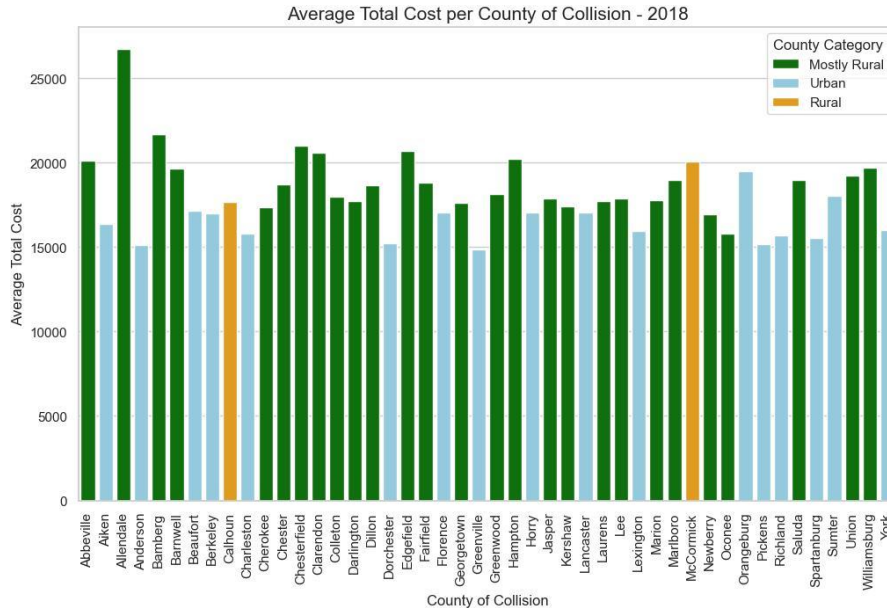
- Source: [National Safety Council Injury Cost](#)
- We added the cost of the injury and the unit damage of the collision to find total final cost of collision
- **Average cost dealt** per incident is **higher** in 'Mostly Rural' counties while number of **collision incidents** are **higher** in 'Urban' counties.

	Injury	Cost
0	Death	1869000
1	Disabling	162000
2	Evident	42000
3	Possible	26000
4	No injury observed	7100



Cost of Injury + Unit Damages

- Minor accidents (**# injuries = 0**) are highest in Urban counties leading to lowest average injury costs in Urban counties.



Note: Y-axis is logarithmic

02.

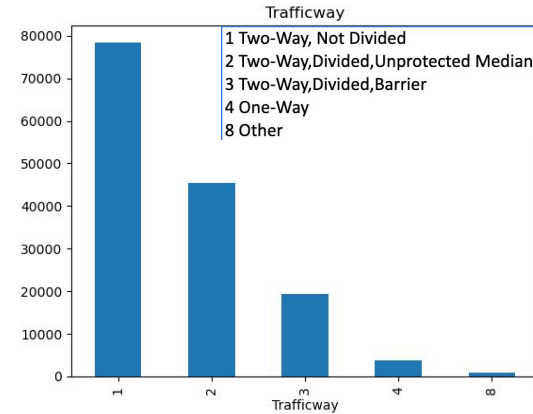
**Recommendations for
Alive@25**

Hypothesis

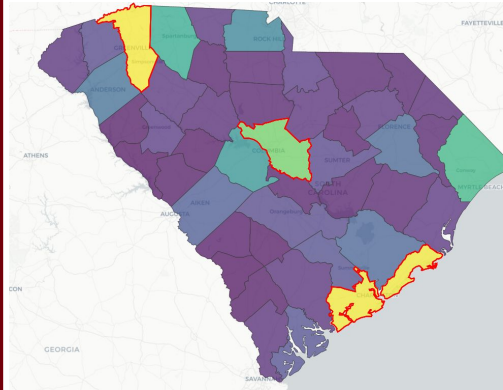
- Hypothesis 1: Collision incidents are higher in Greenville, Charleston, and Richland counties
 - Evidence: *Slide 7*
- Hypothesis 2: Alive@25 takers are gradually decreasing in Mostly Rural Counties; incidentally number of collisions are gradually increasing in these counties
 - Evidence: *Slide 9*
- Hypothesis 3: Collision incidents are higher in urban counties while cost dealt in collisions is higher in mostly rural counties.
 - Evidence: *Slide 10*

Recommendations - 1 of 2

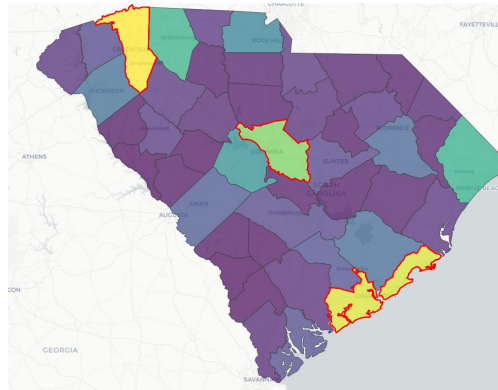
- **Change 1:** Increase the count of two-way divided roads with barriers in Urban counties mainly focusing on 'Greeneville', 'Charleston', and 'Richland' counties.
 - Ref: Hypothesis 1
 - Evidence: *Slide 7 (copied with annotation next)*
 - **Implications:** Change should reduce number of collision incidents.



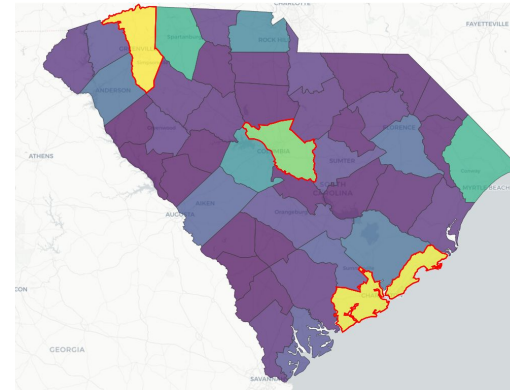
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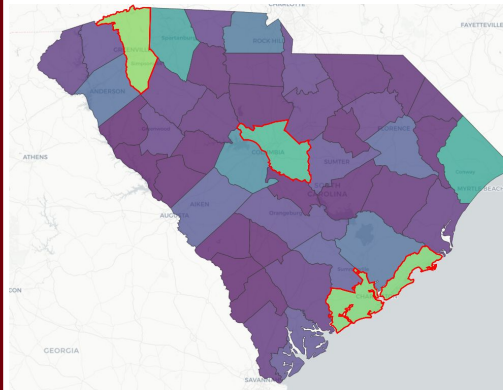
2017



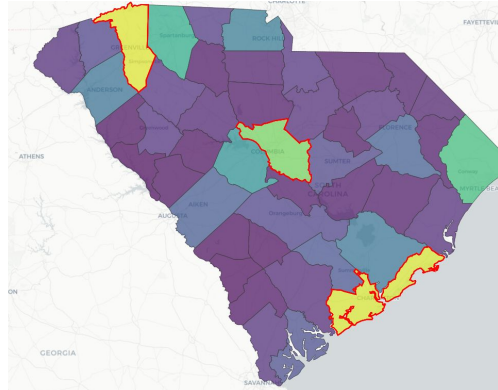
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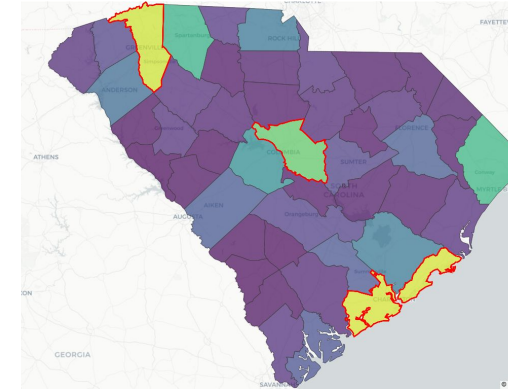
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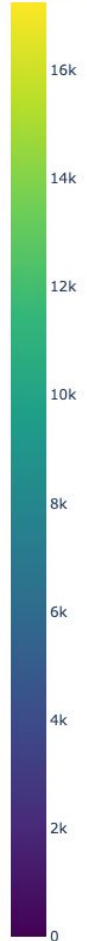


2021



2022

Number of Accidents



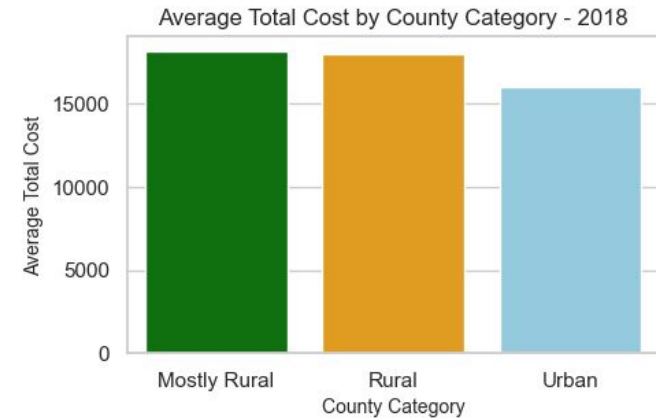
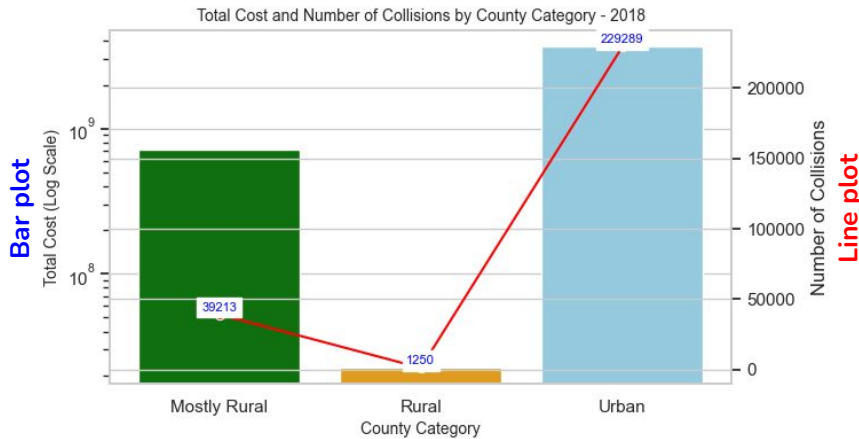
Recommendations - 2 of 2

- **Change 2:** Increase the Alive@25 programs and conduct awareness camps in **Mostly Rural** counties.
 - Ref: Hypothesis 1 and Hypothesis 2
 - Evidence: *Slide 9* and *Slide 10*
(copied with annotation next)
 - **Implications:** Change will lead to reduction in number of injuries and number of collisions in these provinces, and corresponding decrease in cost of accidents.

Cost of Injury + Unit Damages

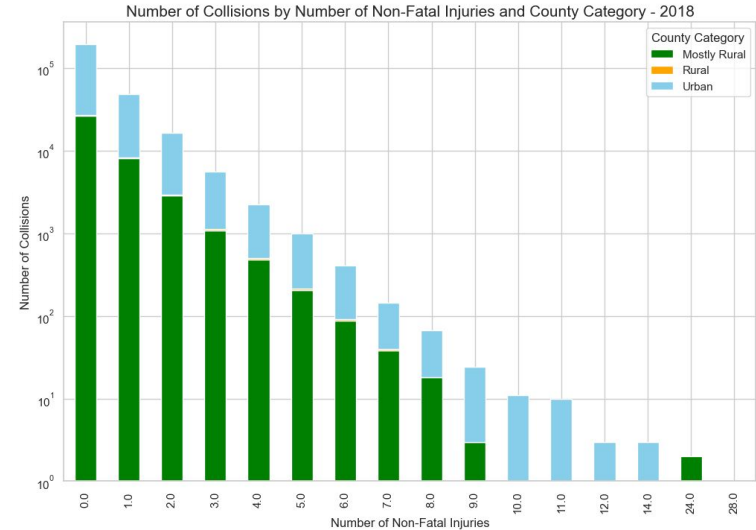
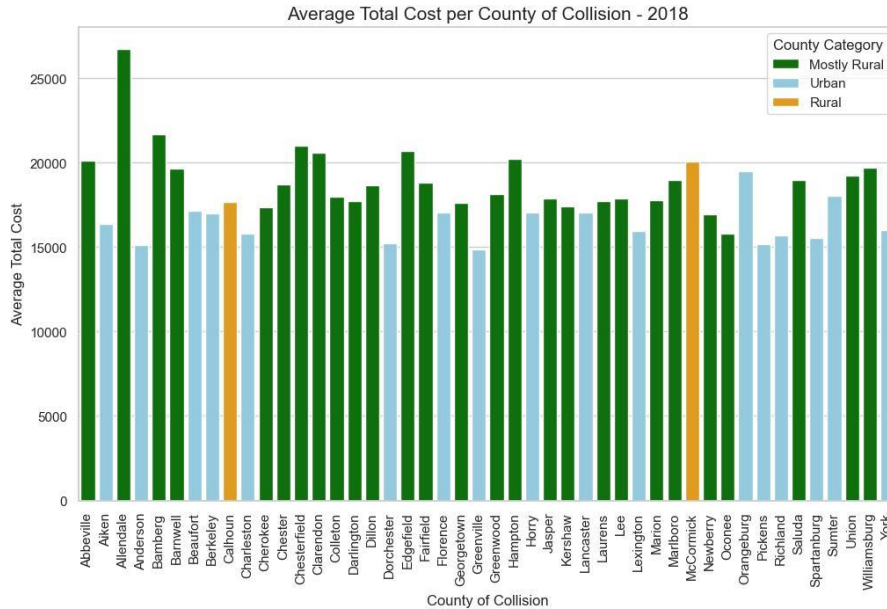
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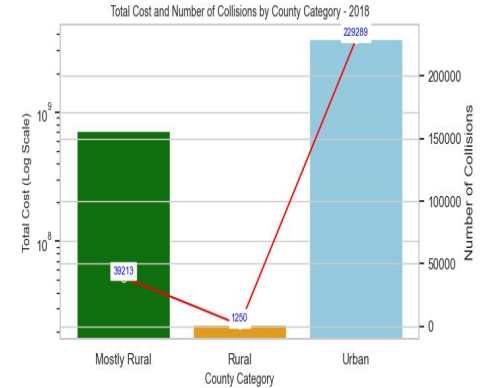
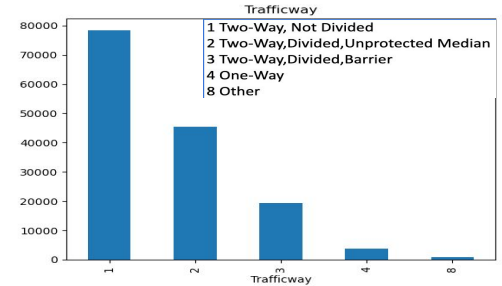
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Recommendations Summary

- **Change 1:** Increase the count of two-way divided roads with barriers in Urban counties mainly focusing on 'Greeneville', 'Charleston', and 'Richland' counties.
 - Ref: Hypothesis 1
 - Evidence: *Slide 7*
 - **Implications:** Reducing number of collision incidents.
- **Change 2:** Increase the Alive@25 programs and conduct awareness camps in **Mostly Rural** counties.
 - Ref: Hypothesis 1 and Hypothesis 2
 - Evidence: *Slide 9* and *Slide 10*
 - **Implications:** Reduction in number of injuries and number of collisions in these provinces



Resources

- Overall Github:

<https://github.com/ai4society/Traffic-Data-Analysis/tree/main>

THANK YOU ALL

Contact Information

Biplav Srivastava –
biplav.s@sc.edu

Bharath Muppasani –
bharath@email.sc.edu

LEARN MORE HERE!

