Analysing Fatal Car Crash Data in the US

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Overview

In the year 2023 a total of 37 355 car crashes occurred. As shown in **Figure 1**, this number has decreased, as opposed to recent years. The US government's **Fatality Analysis Reporting System (FARS),** has publicly provided data regarding each of these accidents. Our goal for this project was to analyze this data and determine what trends are present for different variables such as weather, day of the week, location, state, cause, and EMS response time. See [1, 2, 3, 4].
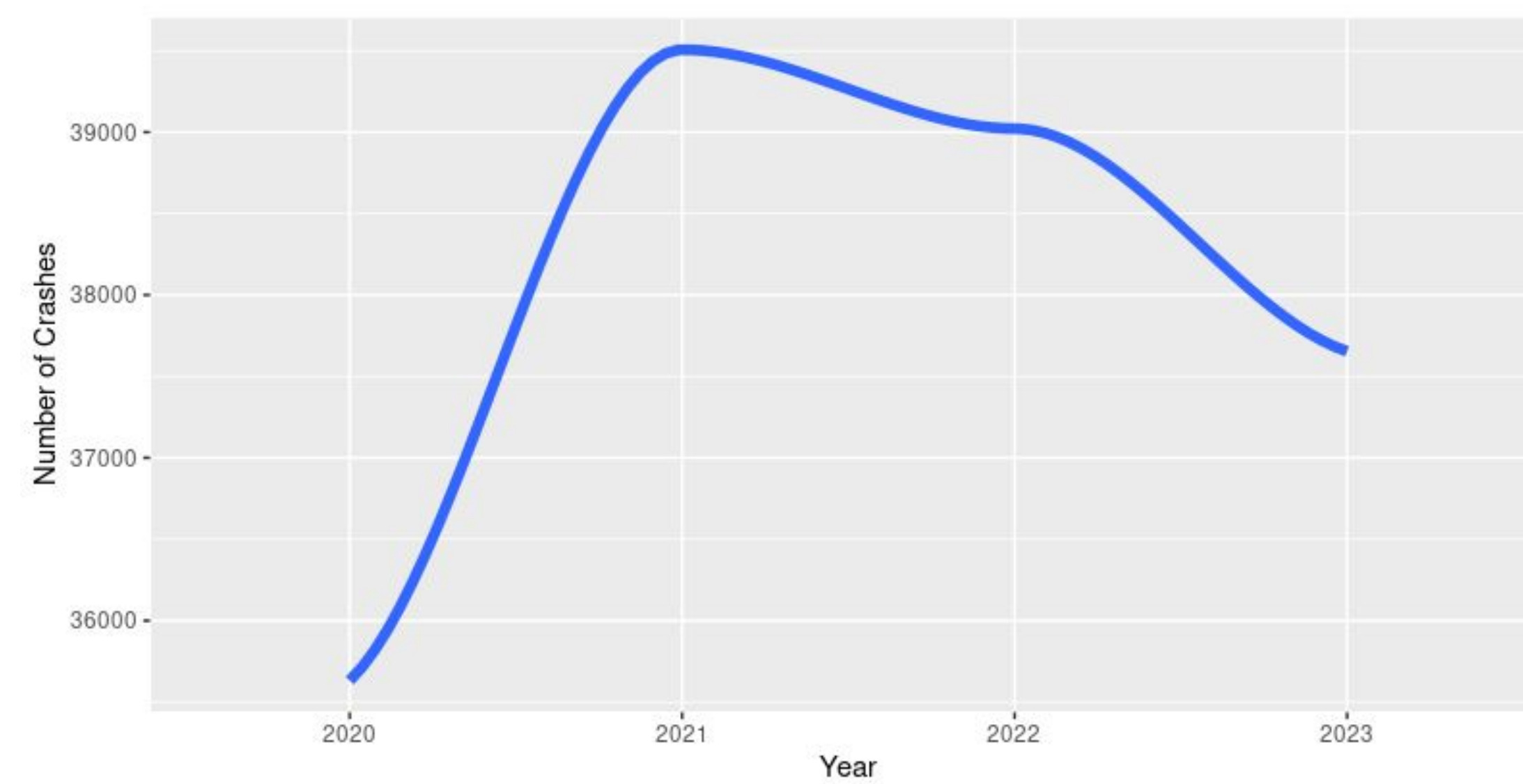

Figure 1: Number of Fatal Car Accidents between the years 2020 and 2023.

Main areas of focus:
- State overview
- Number of crashes per person
- Day, hour, and weather conditions
- EMS response time

Materials and Methods

List of Utilized Software

- R Studio - Data analysis and visualization
- R Packages such as tidyverse, maps, and patchwork.
- GIMP - Improving image quality for product
- Google Slides - Poster production
- Posit.Cloud - Store work online and collaborate in real time

Fatality Analysis Reporting System (FARS)

- 37 355 total observations
- 80 variables
- 24 MB size
- Obtained from NHTSA website, see [1]
- Notable variables include:
  - STATENAME: the state the accident occured in
  - LATITUDE/LONGITUDE: describes the precise coordinates of the accident, allowing us to plot events on a map
  - HARM_EVNAME: describes the cause of the accident
  - HOUR/DAY: describes the time of the accident and the day of the week.
  - NOT/ARR/HOSP_HOUR/MIN: This collection of variables describes the time EMS services were notified of the event, arrived at the event, and arrived at a treatment facility.
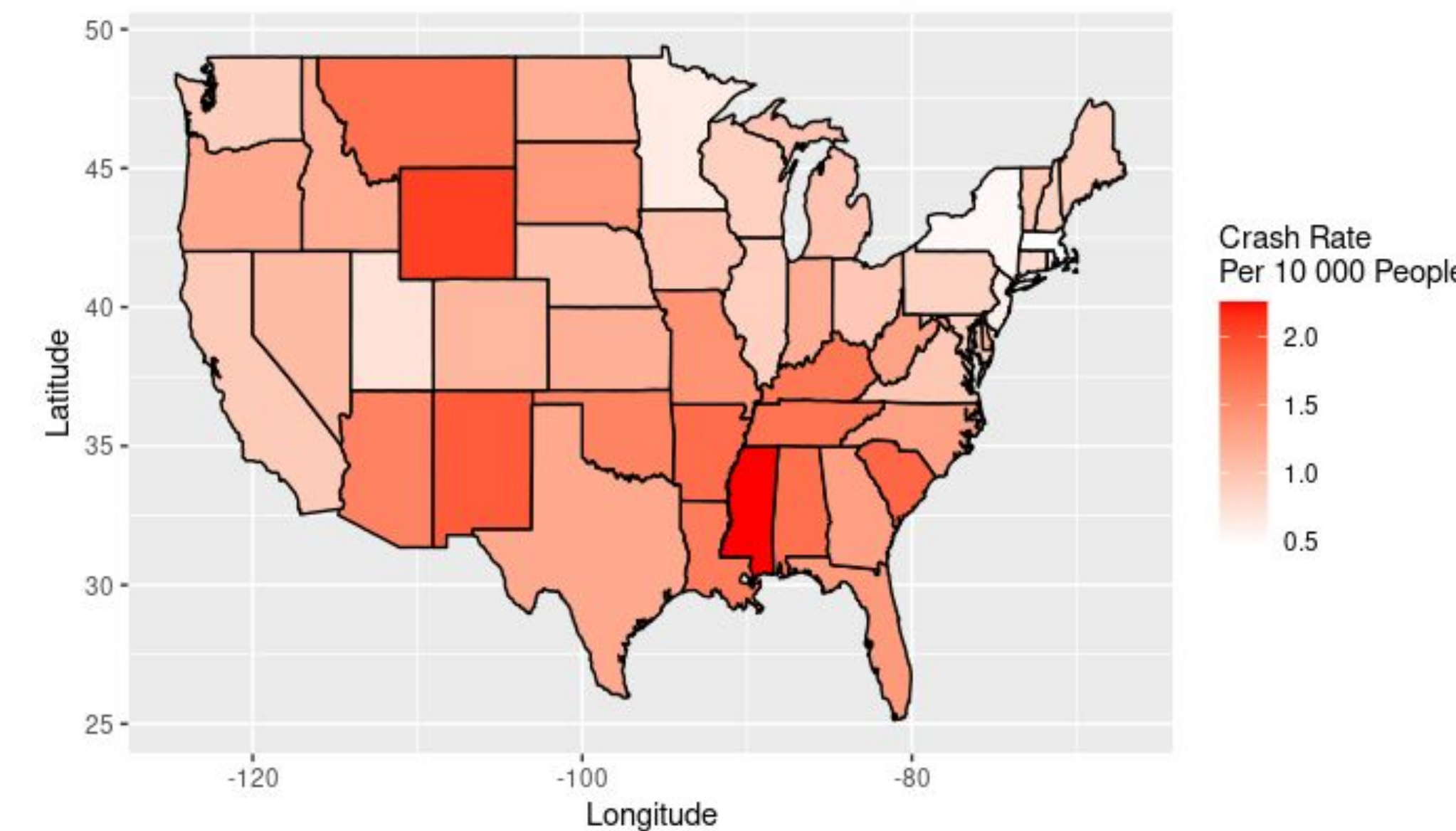
Results

Figure 2: Crash rate per 10 000 people by State

Figure 2 provides the fatal car crash rate in each state using data provided from FARS, expressed in car crashes per 10 000 people, in 2023. In order to create this graph, we sorted the data by state, and the crash rate is calculated by taking the number of fatal car crashes in each state and dividing it by the population of the state in 2023 to get the rate per person.
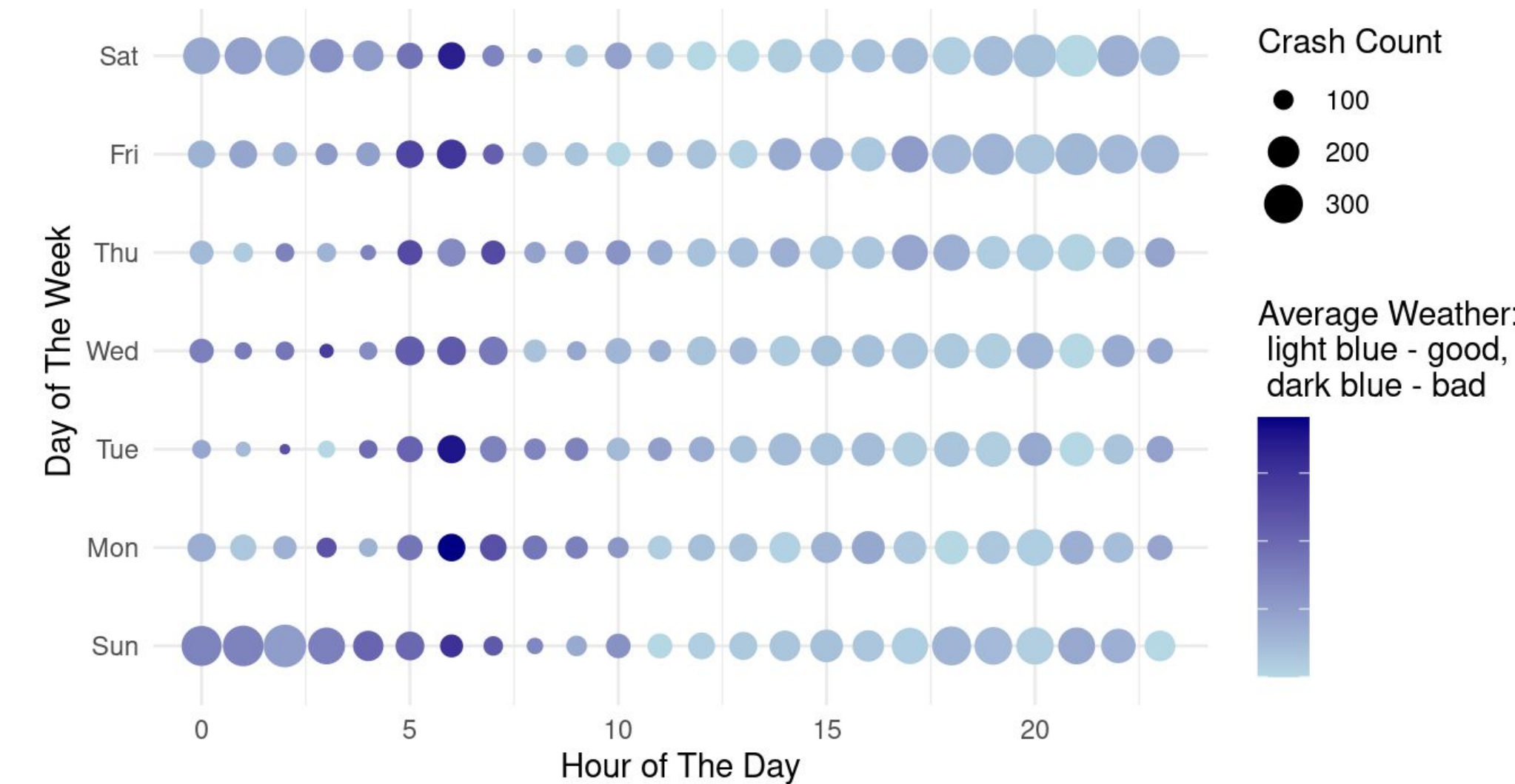

Figure 3: Fatal Crashes by Hour, Day, Weather Group

Figure 3 examines how many crashes for each type of weather, at which hour of the day, and which day of the week. Bigger circles represent a larger amount of crashes, and darker colored circles represent on average poor weather conditions. Weather conditions have also been grouped into three different categories, with weather conditions such as sleet or hail being placed into the poor category, and weather such as rain or slight fog being placed into moderate.
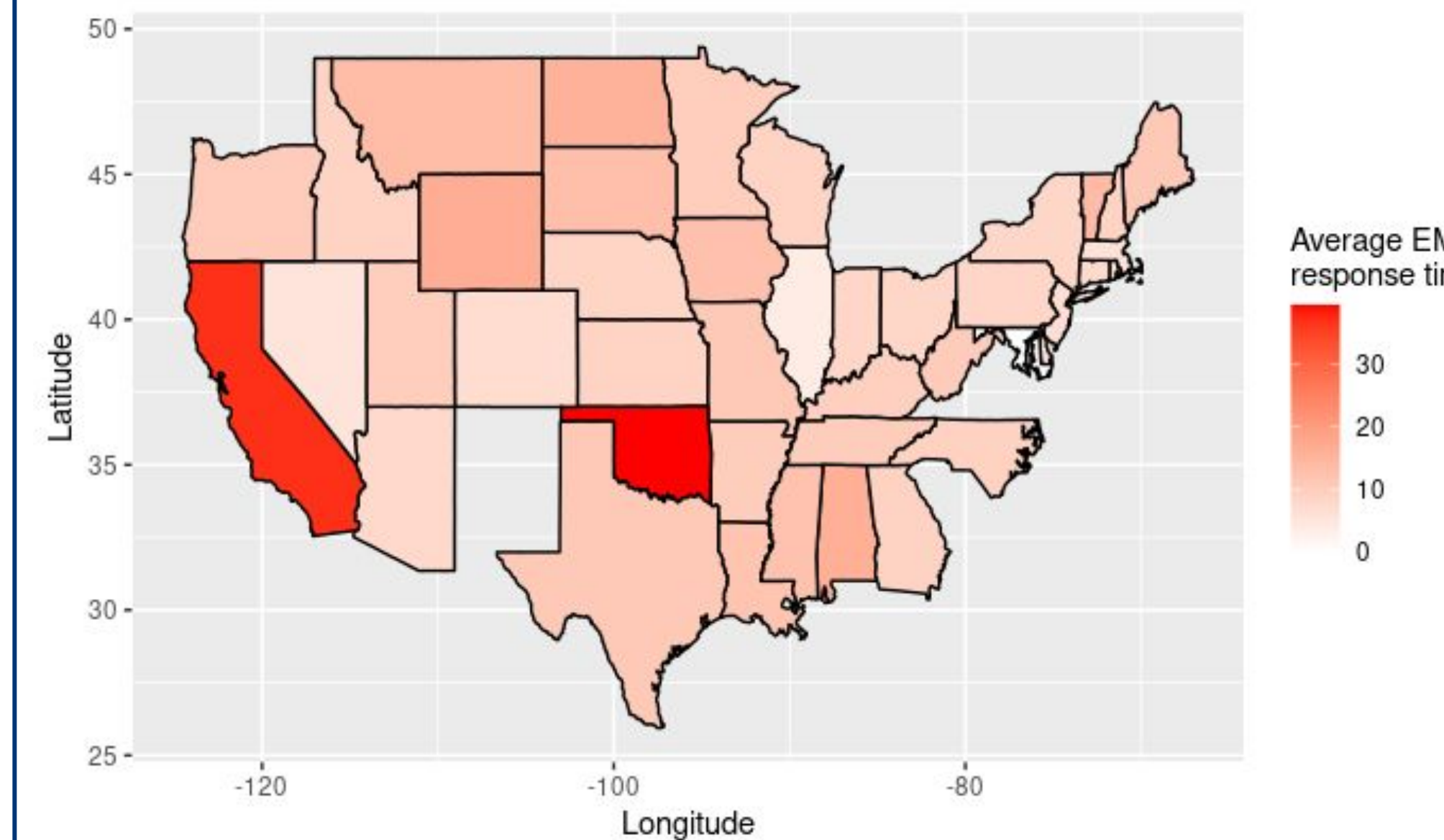
Results Continued

Figure 4: Average EMS Response Time by State

Figure 4 shows the average EMS response time by state.
- Some states have been omitted, as their values were not reported.
- This can be compared to **Figure 2**'s data regarding crash rate by state.
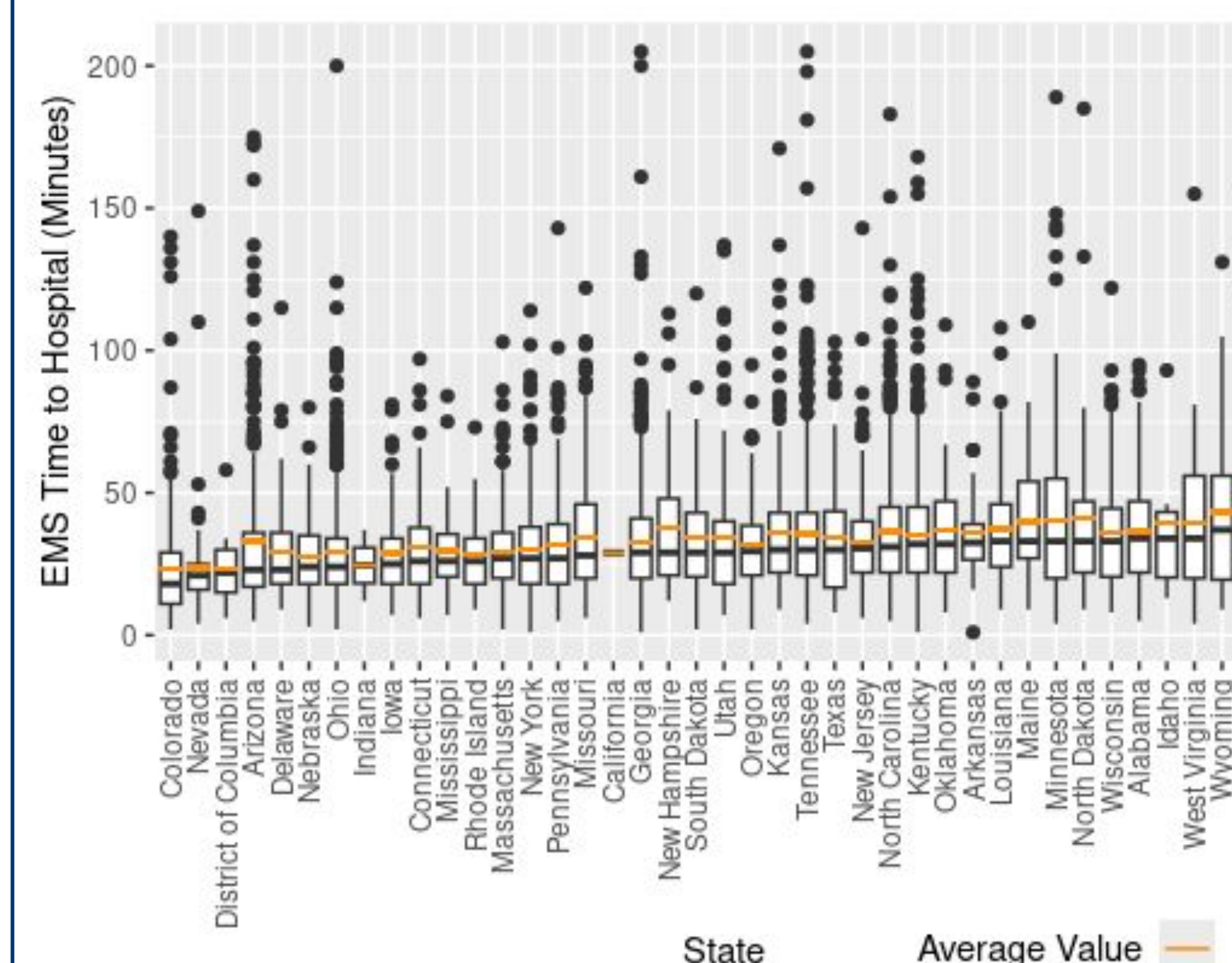- There does not appear to be a strong correlation between **Figure 2** and **Figure 4**

Figure 5: EMS Time to Hospital

Figure 5 shows the time between when the EMS arrived at a treatment facility (hospital) and when they first arrived at the scene of the accident.

Potential Errors:
- The uniform value shown in states such as **California** and **Maryland** could be attributed to different reporting practices across states.

Summary

Overall, our research provided more insight into fatal car crashes in the United States.

Fatal Crashes in Each State - Figure 2
- NY, MN, UT have the lowest crash rates
- WY, MS, NM have the highest crash rates
- Road Infrastructure and law enforcement main factors

Fatal Crashes by Hour, Day, Weather Group - Figure 3
- Weekends have the most crashes
- Rush hour traffic with large amount of crashes
- Morning contains the most severe weather

EMS Response - Figure 4
- California and Oklahoma have elevated values because of some outliers

EMS To Hospital - Figure 5
- More data required to draw full conclusions
  - Eg. Number of hospitals, money spent on infrastructure, EMT and driver education levels

References

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6. National Center for Statistics and Analysis. (2025, April). *Fatality Analysis Reporting System analytical user's manual, 1975–2023* (Report No. DOT HS 813 706). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813706

Acknowledgments