Driving safety in the USA: Why some states have higher fatal car accident rates than other states?

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1. Introduction

How to decrease car accidents is always a very important issue not only for the government but also for citizens. Additionally, decreasing car crash is not something can be done by just improving cars' equipment. "Despite more safety equipment in cars, car crash deaths are rising," reported by USA Today in 2016. Hence, what reasons may have a higher probability to cause vehicle accidents?

2. Origin of the data set

In this research, an open data set is used and supporting for analysis. Fatality Analysis Reporting System (FARS), is collected by National Highway Traffic Safety Administration (NHTSA). NHTSA uses data from many sources, including the FARS which began operation in 1975. FARS is a census of fatal motor vehicle crashes with a set of data files documenting all qualifying fatalities that occurred within the 50 States, the District of Columbia, and Puerto Rico since 1975. By utilizing this data set along with other supplementary data sets, this research is trying to find key factors with higher probability to cause the fatal car crash.

3. Structure of your data set

The variables used in this research are "states"(categorical variable), "location"(longitude, latitude), "drunk"(dummy variable), "time"(hour of the day), and "fatals"(the number of fatality involved in each car accident). This research analyzes the relations of "fatals" and other variables, for example: which states have higher fatalities than other states?

4. Hypothesis

Which states have more car accidents than others? The answer is Wyoming, Montana, and Mississippi (which are called "dangerous states" in this research). Although their total number of accidents are not the highest, after the numbers of accidents are divided by their number of drivers, the result shows the three states have highest fatal car crash among all states. The key factors which may cause more car accidents are location, *time*, *drunk*, and *weather*. This research assumes

that in some specific time, under some specific weather conditions, or at some specific areas, there will be higher probability causing car crash happen. Additionally, the research discusses the two variables' dependency. It assumes that drunk driver will have a higher probability to cause car crash in some specific time. Last, the research states that under certain weather conditions, there will be higher probability to cause fatal car accidents.

5. Methods

In this part, the data set is conducted in five different ways. First, car fatalities. The fatalities are added up by states and divided by the each state's number of drivers. Second, geographical fatalities. The fatalities are added up by their location, and then are mapped on the maps. Third, the fatalities are added up by the time when the fatalities happened. Fourth, this part analyzed the relation of Drunk driving and time which is divided into four period: morning(6-12), afternoon(12-18), evening(18-24), night(0-6). Moreover, Chi-squared test is used here to test the independency of drunk driving and time. Last, weather. The fatalities are added up by the weather conditions when the fatalities happened.

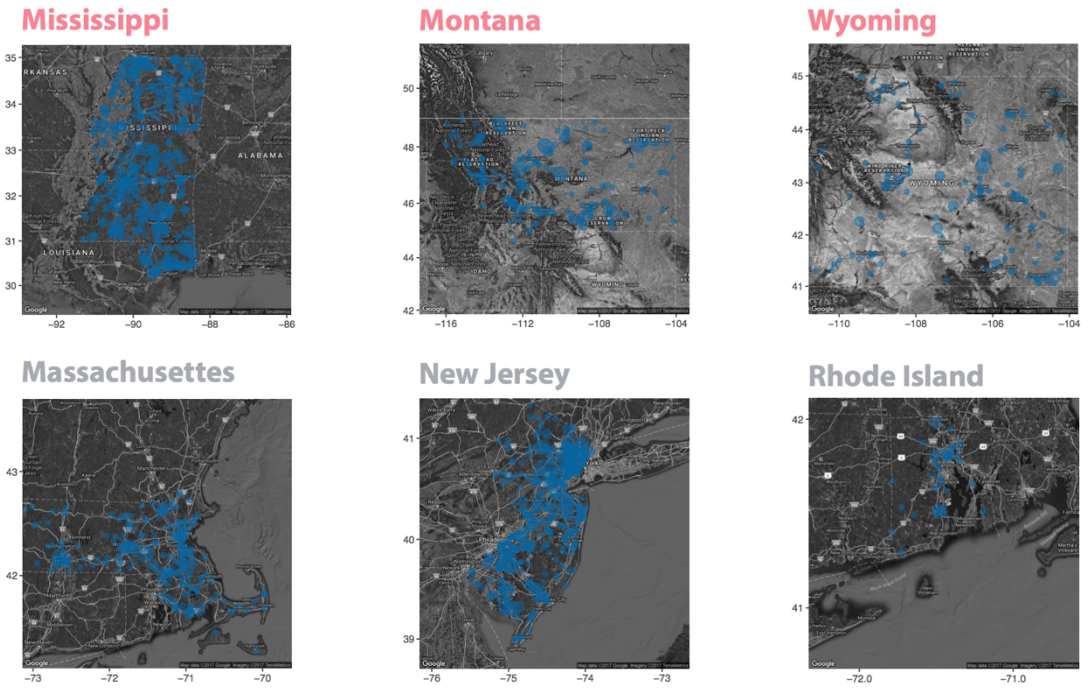
6. Findings

The results of this research are illustrated in four points. First of all, in Wyoming, Montana, and Mississippi, there is higher probability causing vehicle accidents when the drivers go by mountains or drive on highways. Secondly, in the three states, there is higher probability causing vehicle accidents from 3 pm to 8 pm. Third, the three states' drunk factor has relation with time. More drunk drivers cause car accidents at night (from 0 am to 6 am). Last, the results are ambiguous. Mississippi and Wyoming both have higher vehicle accidents when the weather is clear. However, the result cannot be applied to Montana.

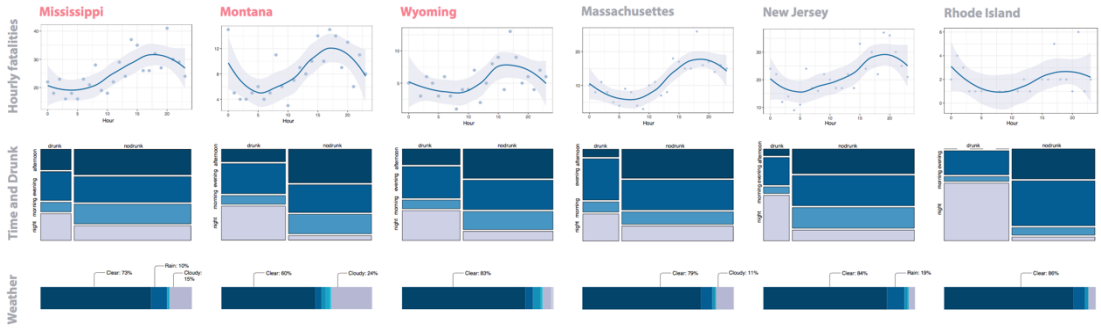
(1) Car fatalities: In this part, the data are normalized by each states' number of drivers. The consequence of normalization shows Wyoming, Montana, and Mississippi have higher fatal car accidents rates than other states. Due to the higher number of drivers of Texas, Florida, and California, the three states have more fatal car accidents than other states. In order to compare the states with

higher probabilities causing car accidents, the “safe states” are chosen which are Rhode Island, New Jersey, and Massachusetts.

(2) Geographical fatalities: Compared with “safe states” (Rhode Island, New Jersey, and Massachusetts), the “dangerous states” (Mississippi, Montana, and Wyoming) usually have more fatal vehicle accidents on the highways or in the mountains. The “safe states” usually have more fatal accidents in urban areas.



(3) Time, drunk driving, and weather: In this parts, the research is analyzed by three dimensions. First, time. Compared with more dangerous states, the peaks of hourly fatalities in “safe states” are later than “dangerous states”. This makes sense. More car accidents happened in urban areas of “safe states”, the time for getting o works usually are later than 17:00. This result of time factor may show that people at this time usually just get o work and drive their car from work place, and they are tired as well. In drunk driving part, except Mississippi, the “dangerous states” have more fatal car accidents when the drivers were drunk. Moreover, the result states a straightforward explanation that drivers in the three states get drunk and cause more fatal car crash at night than in other time.



7. Conclusion

The conclusion can be divided into three parts. First, in Wyoming, Montana, and Mississippi, there is higher probability causing vehicle accidents when the drivers go by mountains or drive on highways. Secondly, in the three states, there are more fatal car accidents happened from 3 pm to 5 pm. Third, the three states' drunk factor has relation with time.

8. References

(1) https://www.usatoday.com/story/money/cars/2016/08/25/car-crash-deaths-climb-despite-better-auto-safety/89275162

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