

Case study of Indian road safety

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Introduction

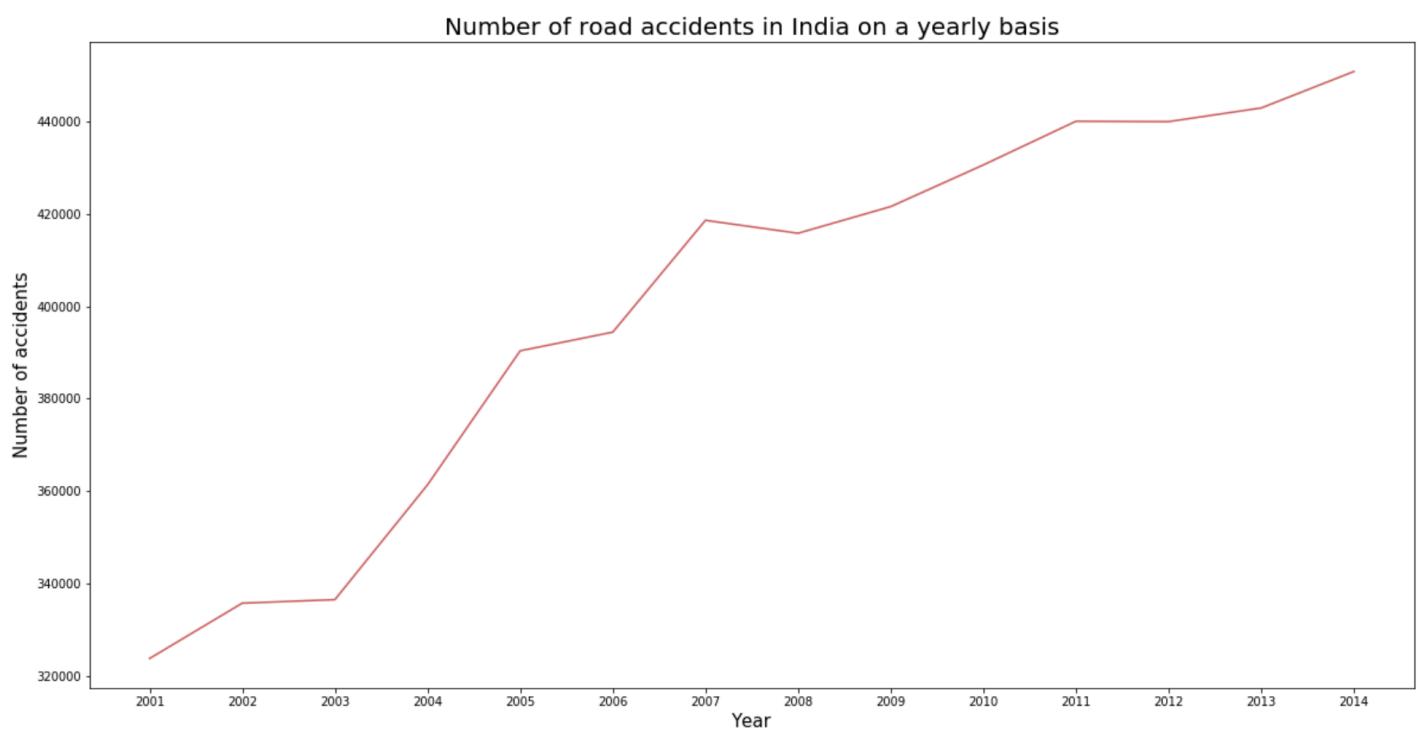
- Road accidents are a serious public health hazard.
- In India being such a populous country, there are about **5 Lakh road accidents each year.**
- Many of these road accidents are fatal in nature causing large loss of lives and property.
- In India, the Ministry of Road Transport and Highways (MoRTH) is the apex body that handles road safety.
- The limited resources of the country means that funds must be judiciously spent to make roads which take care of road safety.
- Many times, the drivers are at fault for various offences such as unruly driving, driving under influence, under age driving, etc.
- Road safety as a holistic issue must include roads, motor vehicle and human lives.

- Considering the fact that India is a federal system, the states are majorly responsible for implementing road safety.
- According to the data analysed from the government databases, almost 50 percent of the road accidents are fatal. This means it is definitely an alarming health hazard.
- In the case study analysis done here, the data has been completely extracted from official sources of the government. This data is released by data.gov.in . Various visualisations are done through python packages to understand the data better.
- Moreover, in a case study it is important to understand how other nations have dealt with the issue of road safety. As a result, a comparative analysis of road safety in United Kingdom is done for understanding the blackspot in the Indian road safety.

Indian road accident

data analysis

- Using the powerful data visualisation packages of python, we do a few important data analysis of road accidents which have occurred in India from 2001-2014.



The above data shows that there is a positive increase of road accidents each year.

- As we can see, the road accidents in data have been increasing each year. The trajectory of increase is almost linear in nature.

- After performing a simple linear regression on to the data shown above, we can predict the number of accidents from 2015-2025. The predicted results using the scikit learn linear regression model on python gives us the following results.

	Year	Total
1	2015	475988.0
2	2016	486092.0
3	2017	496196.0
4	2018	506300.0
5	2019	516404.0
6	2020	526508.0
7	2021	536612.0
8	2022	546716.0
9	2023	556820.0
10	2024	566924.0

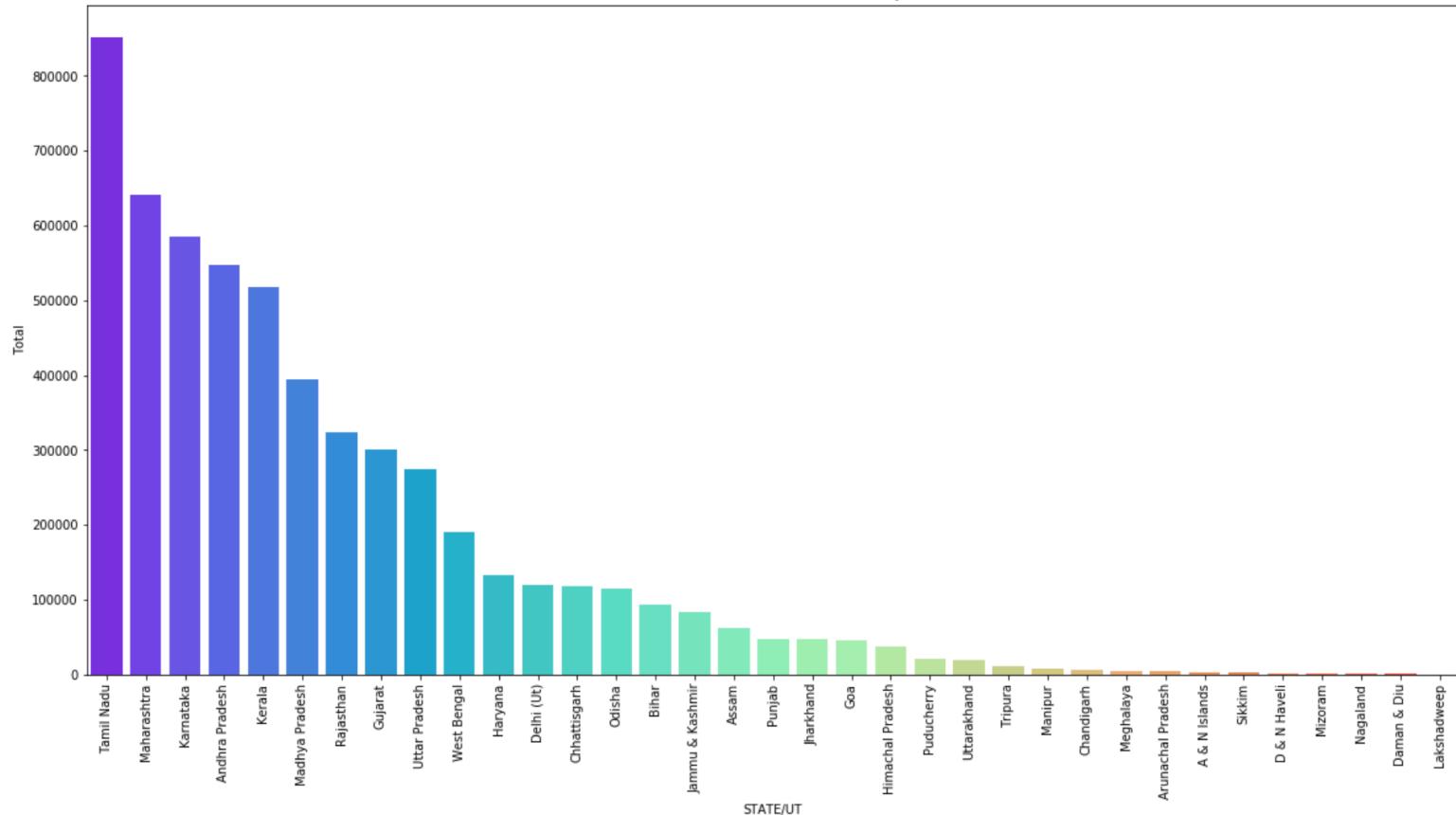
Predicted number of cases

- As it can be seen from the data above, the total number of accidents are predicted to rise to 566924 accidents annually. This is an alarmingly large number

and it'll require effort from all stakeholders to ensure that the rise in accidents maybe curbed.

- In order to understand the accidents better, we must rely on the government data of each state's contribution towards road accidents. The data in possession contains cases from 2001-14. The data has been visualised as bar plots shown below.

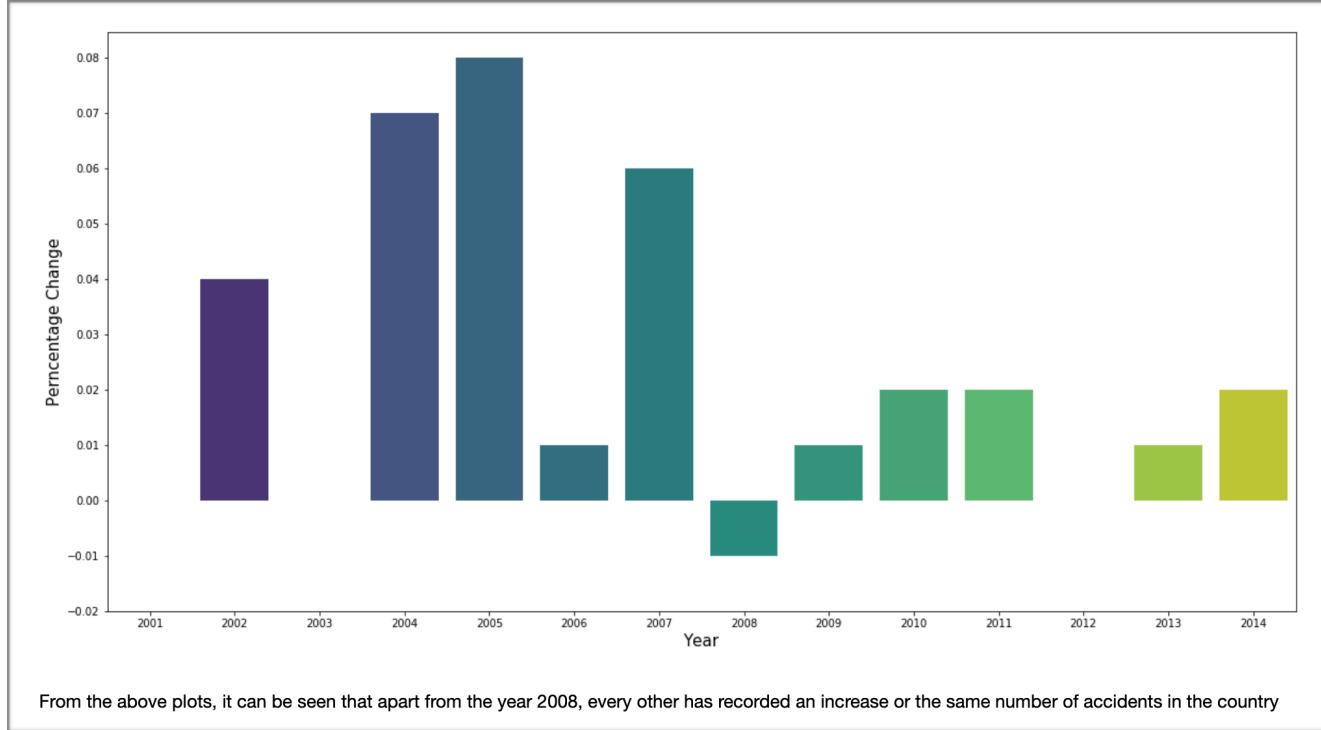
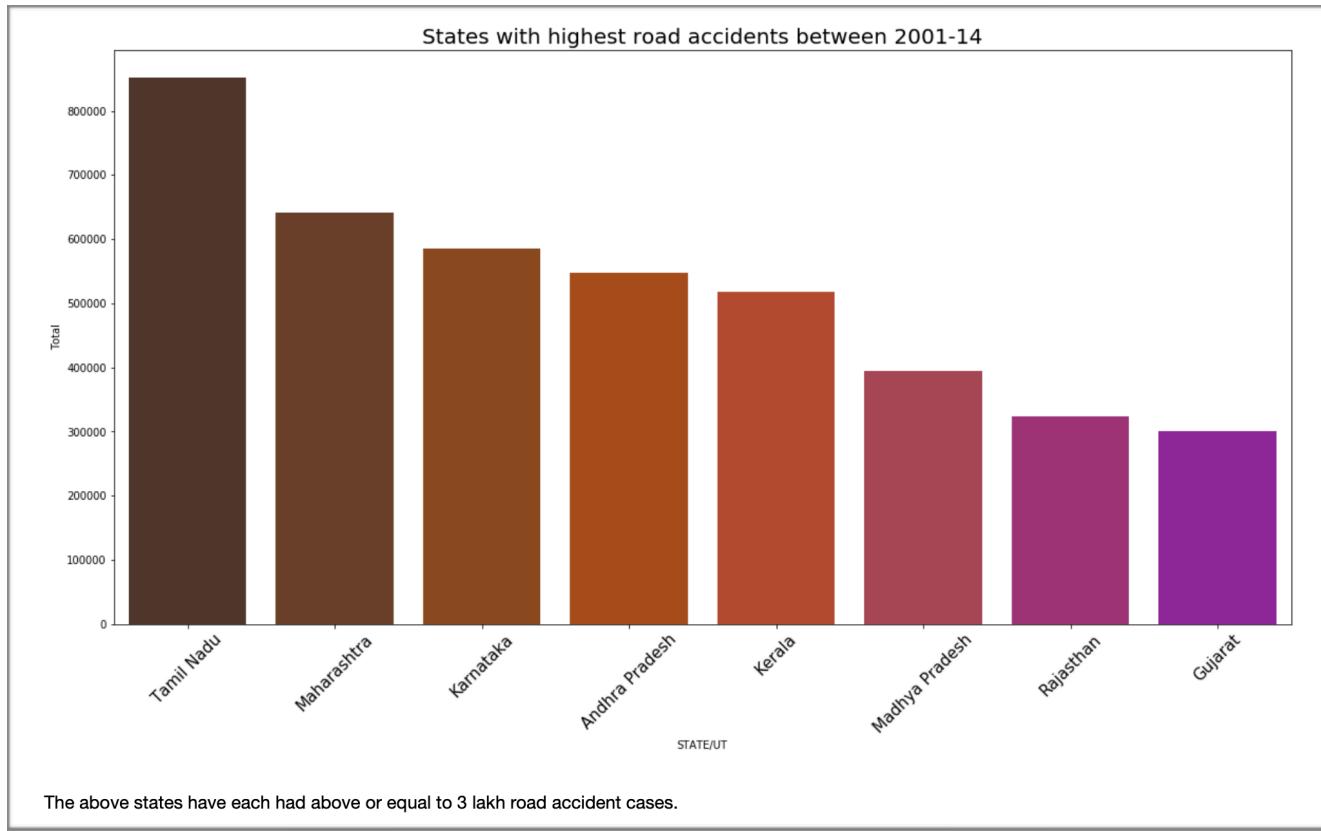
Cases of road accidents in each state/UT from 2001-14



A visual representation of all the road accidents in the states

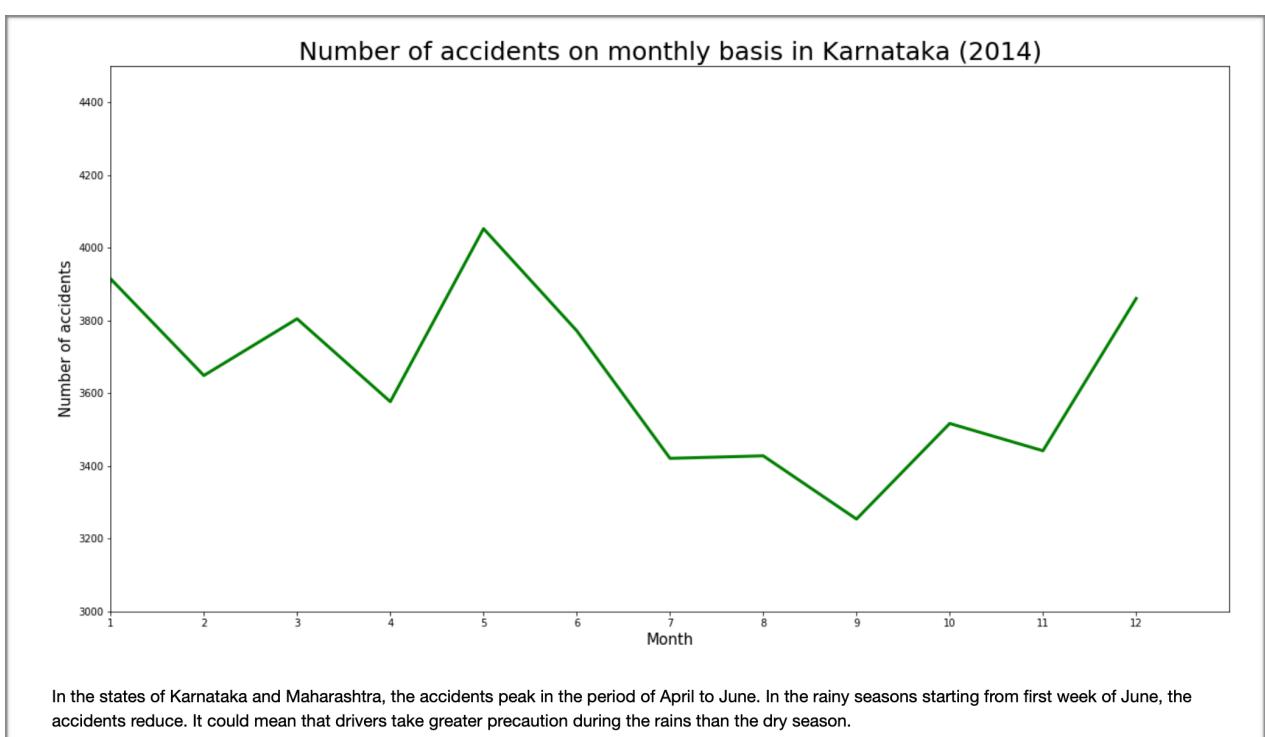
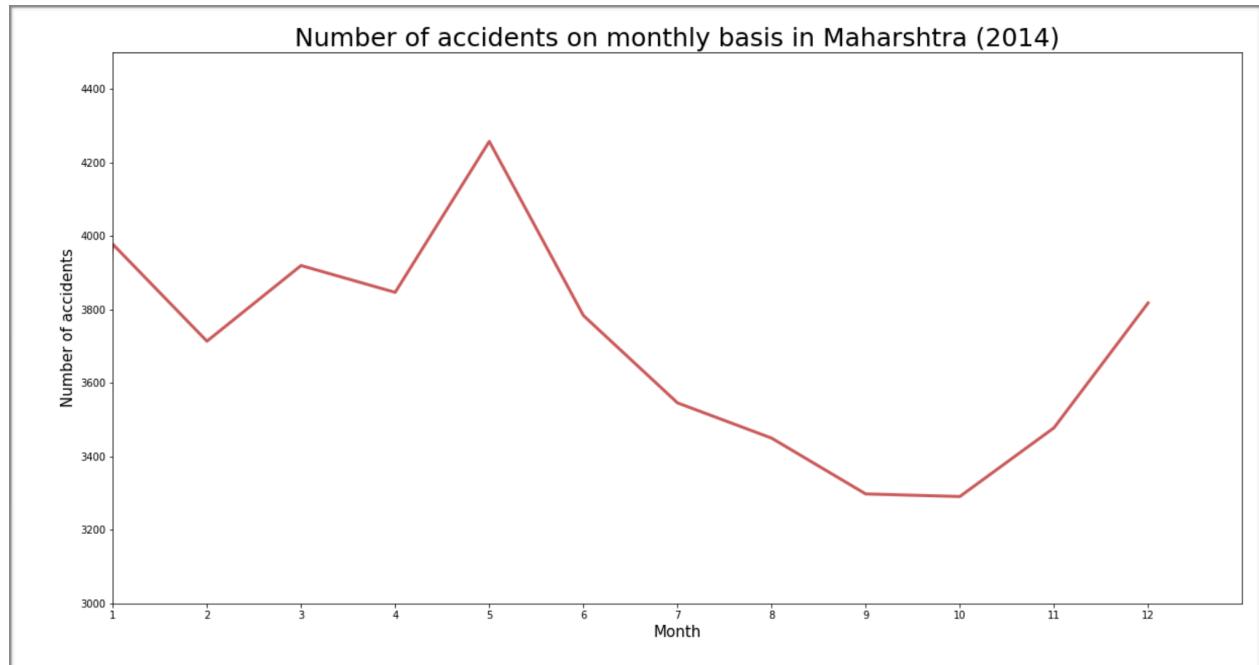
- From the above data, it is evident that **Tamil Nadu** leads the way in road accidents followed by **Maharashtra, Karnataka.**

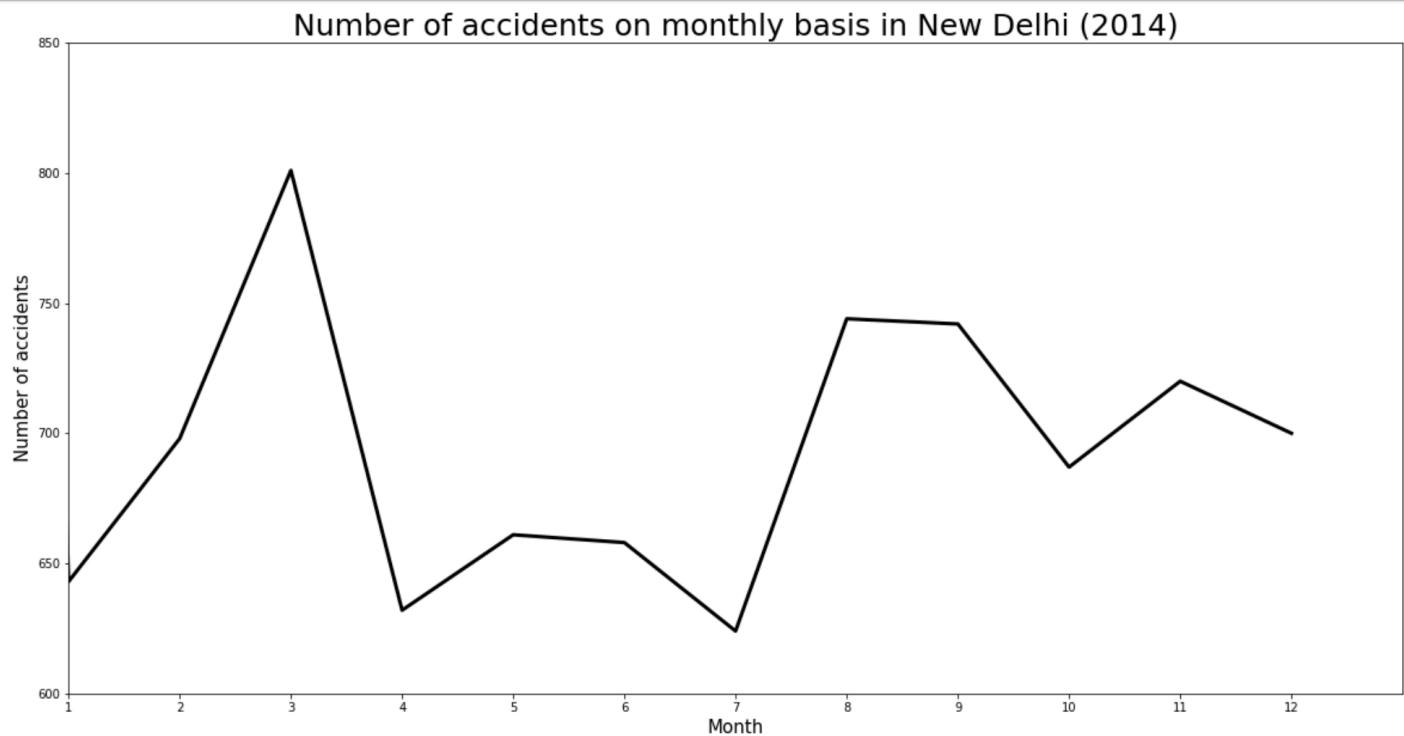
- For a clearer visualisation, a cutoff of 3 lakh road accidents was used to visualise the states which have been plagued by road accidents.



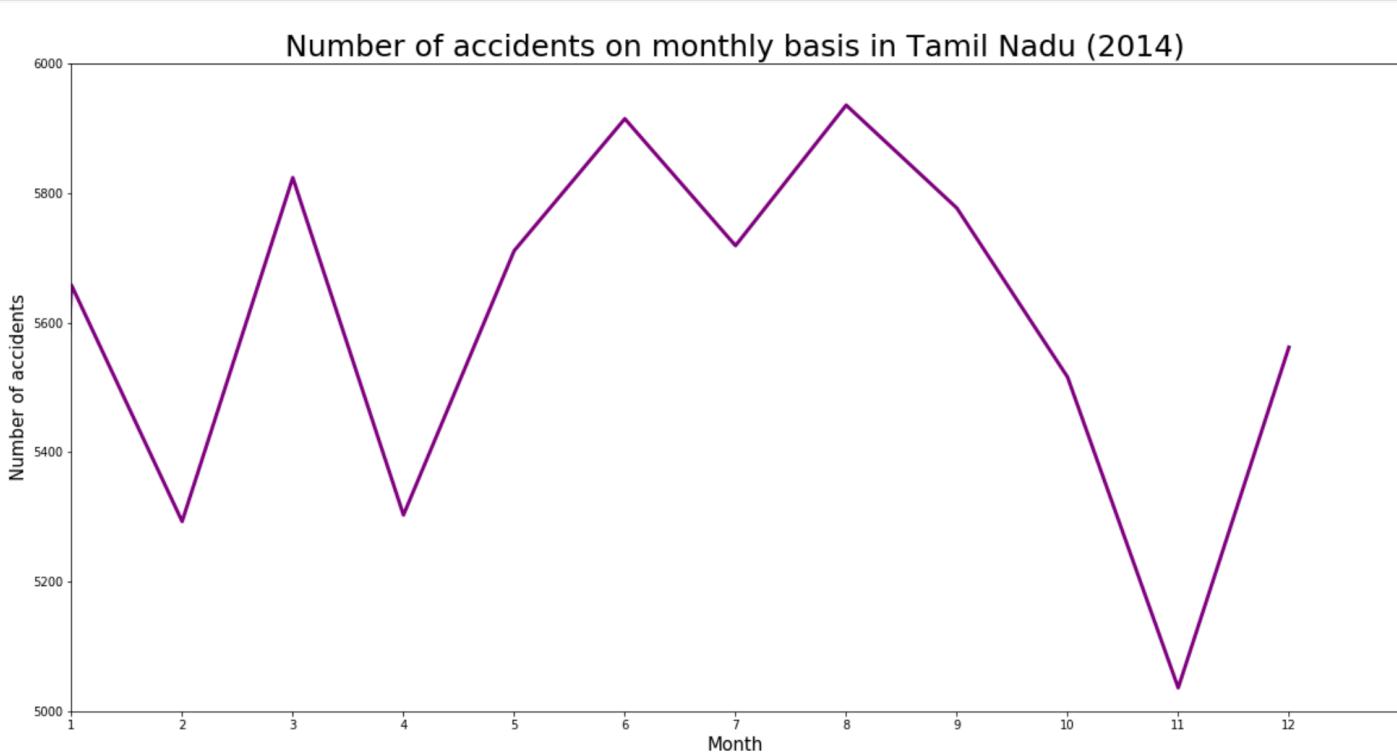
- It is clearly visible that some states are plagued with higher cases of road accident.
- Some of the factors that may play a role in causing road accidents are:
 1. Weather conditions depending upon month in which accident took place.
 2. Education qualification of the driver.
 3. Age group of the driver
 4. Visibility during the accident occurrence.
- The Government of India does a superb job at recording the data based on all the above factors and anymore.
- However, for a preliminary case analysis, we consider the above four factors.
- Upon analysing the month of accidents, we can get a roundabout idea of the weather conditions that may be prevailing while the accident took place.

- For the purpose of weather conditions analysis, we have considered the top 3 most effected states Tamil Nadu, Maharashtra, Karnataka along with New Delhi to understand the situation in the national capital.



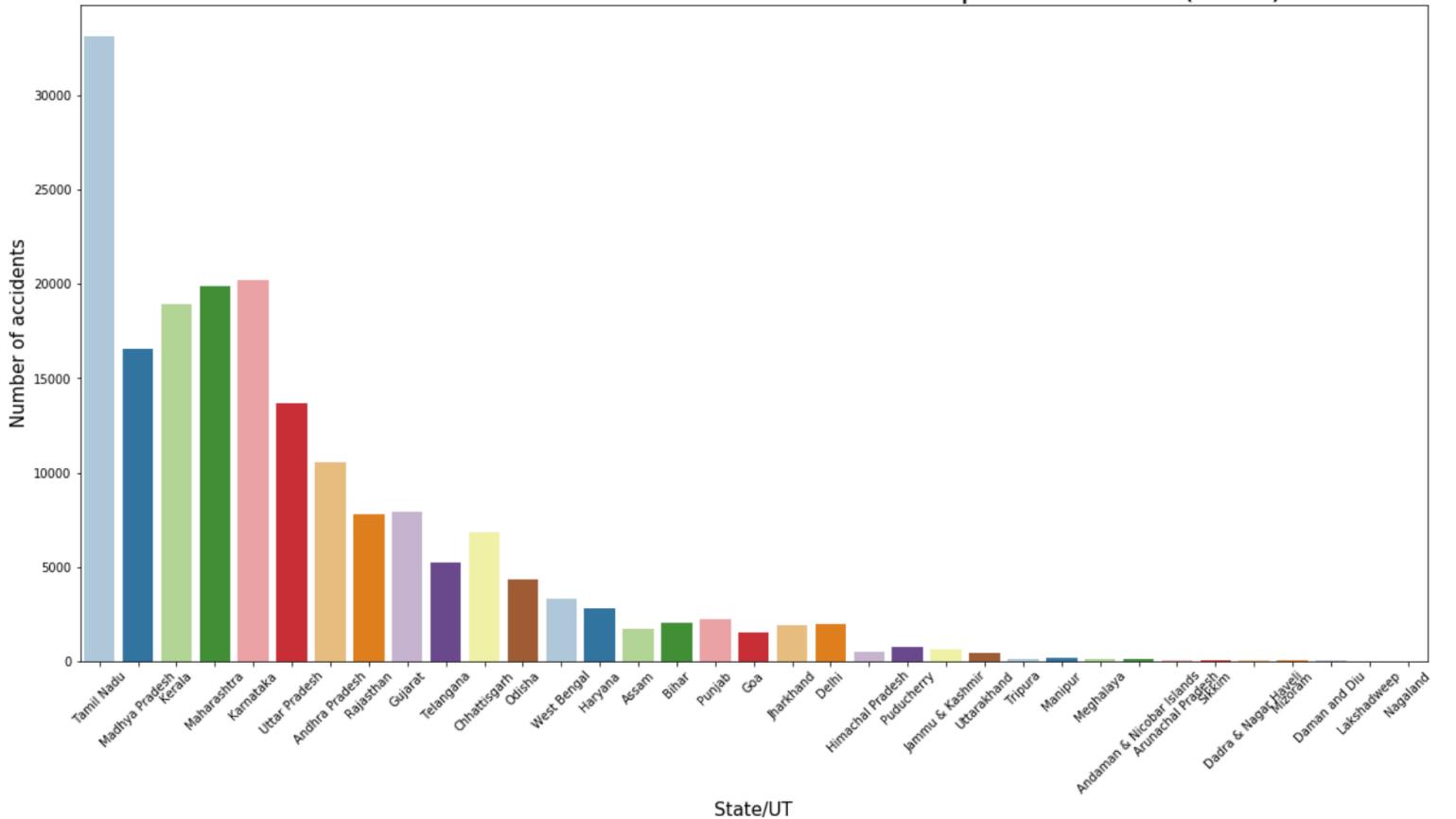


In New Delhi, accidents seem to peak early in the year. As expected, the accidents during the rainy season from June to July are low. However, a sharp increase does take place in August.

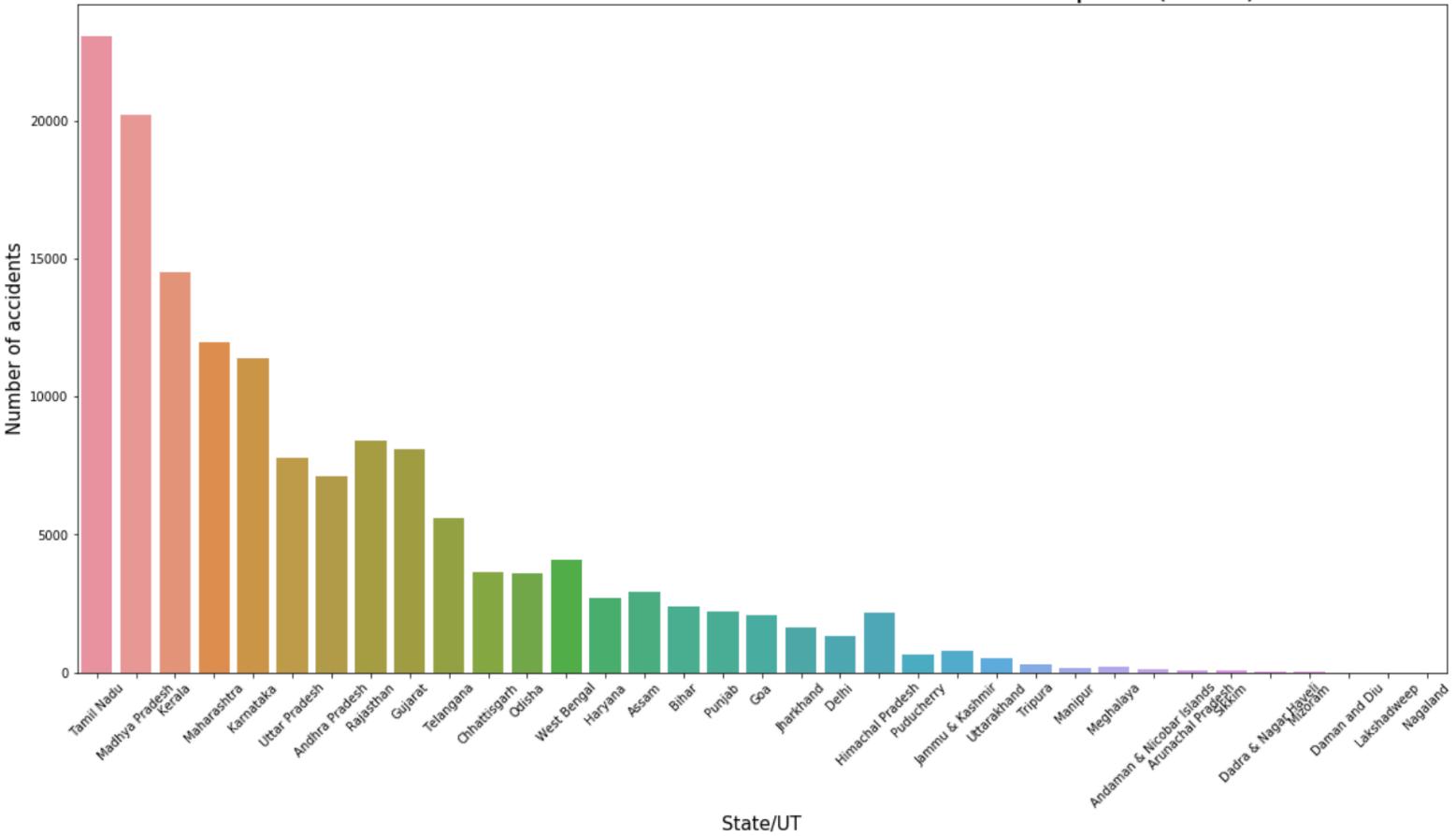


In Tamil Nadu as well, the accidents become lowest during the peak rainy months which last from October to December.

Drivers involved in road accidents who are 10th pass or above (2016)



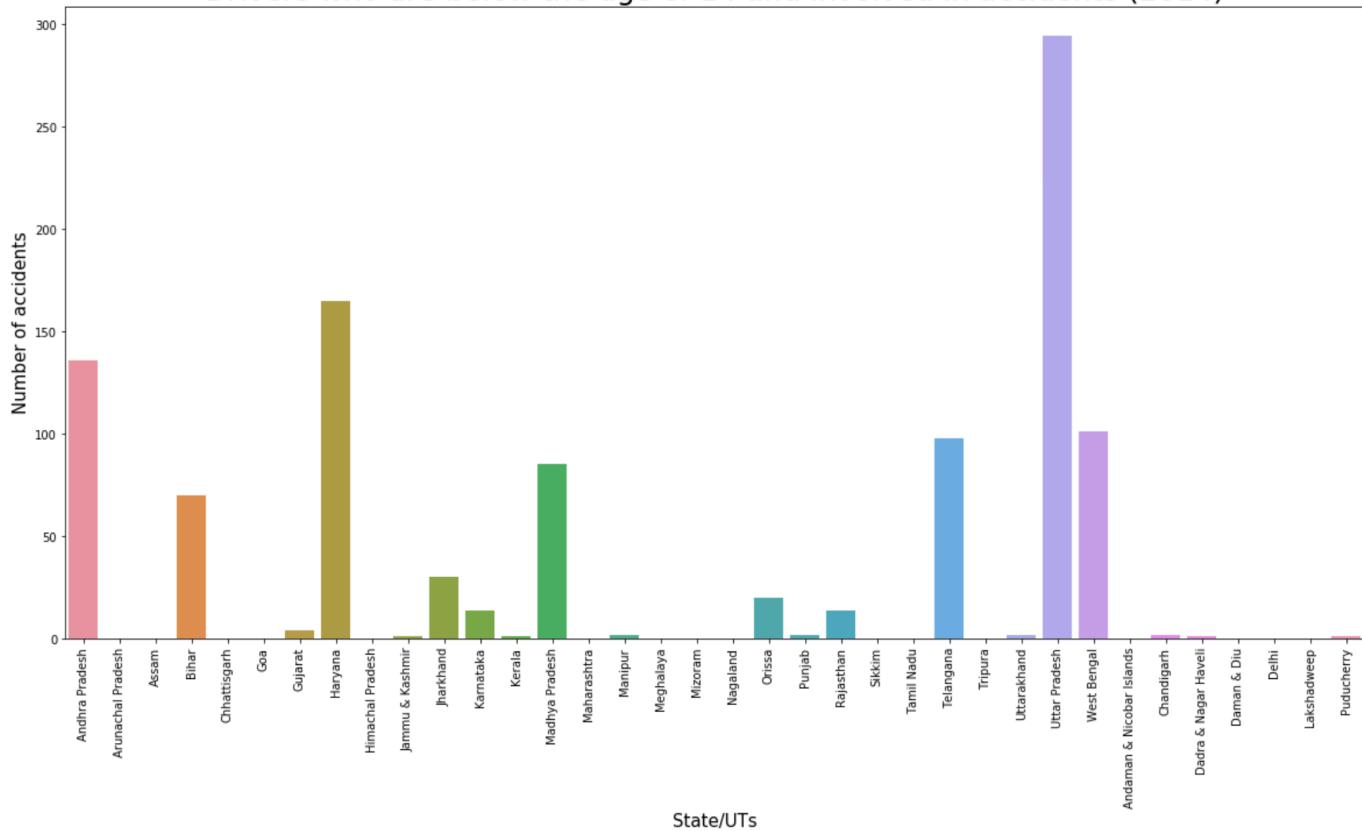
Drivers involved in road accidents who are not 10th pass (2016)



From the above visualisations, it is observed that education plays little role in driver accidents. In Tamil Nadu, under both 10th pass and 10th fail criteria, the accidents are higher. The case is similar for most of the states. However, the cases in the North East states is extremely low even with limited road development due to its challenging topological conditions.

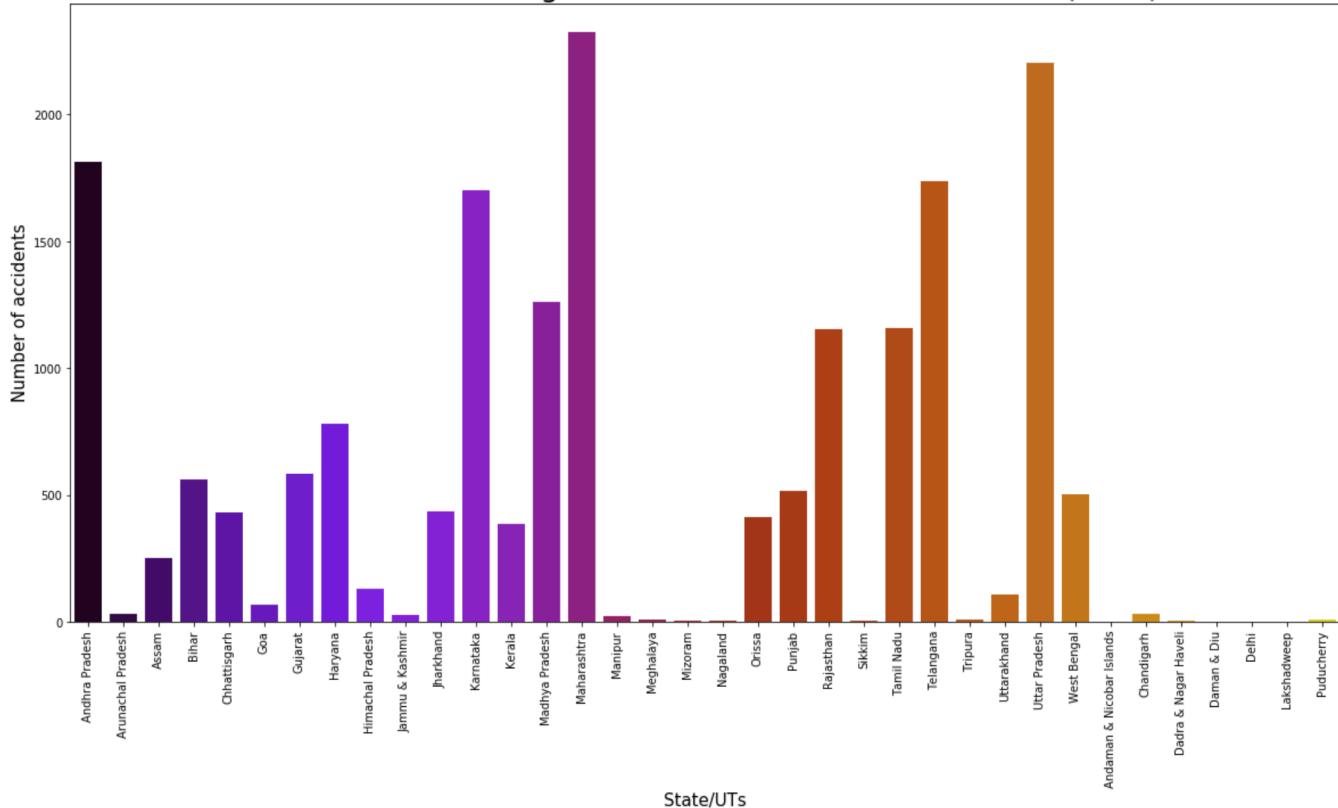
- From the above analysis, it is hard to correlate education with number of accidents. In almost each state, it is observed that number of educated drivers are same as the under educated drivers.
- However, one important observation to be made here is that the low education poses a challenge for the road safety.
- It is important to convey traffic signals with signs more than words since most of the under educated drivers will not be able to interpret the important signs.
- Age groups involved in the accidents are also important to understand the type and reason of accidents.
- Here, an analysis on the data of 2014 road accidents classified by age group is done.
- In addition, we try to visualise the data of Andhra Pradesh, Karnataka, Maharashtra through a pie chart.
- The visualisations maybe shown below.

Drivers who are below the age of 14 and involved in accidents (2014)



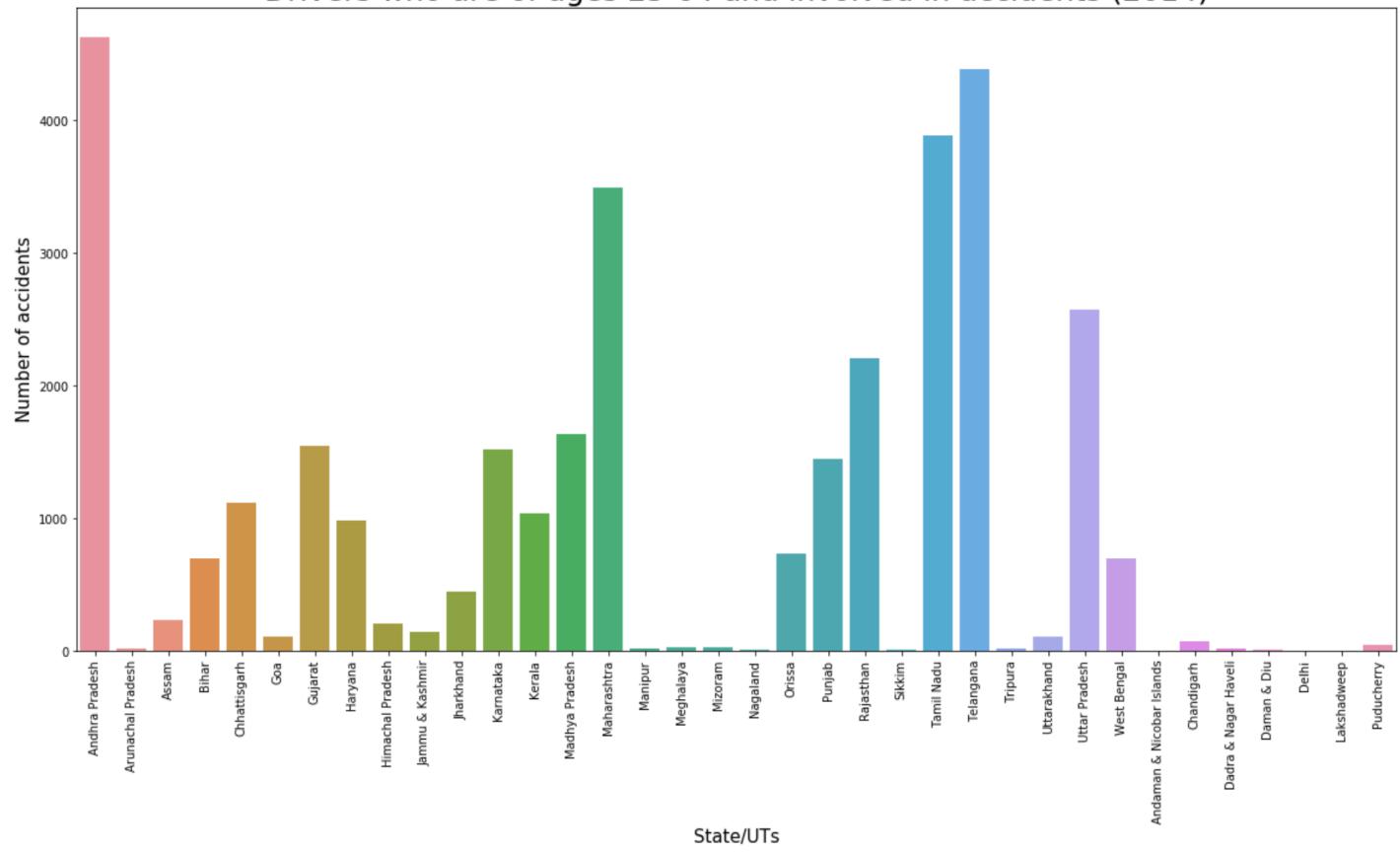
From the above visualisation, the under age driving causing road accidents is extremely severe in Uttar Pradesh. Haryana, Telangana, West Bengal, Andhra Pradesh, Bihar, MP are also notable mentions. Under age driving punishments aren't enforced as strictly in these states as in other states.

Drivers who are of ages 15-24 and involved in accidents (2014)



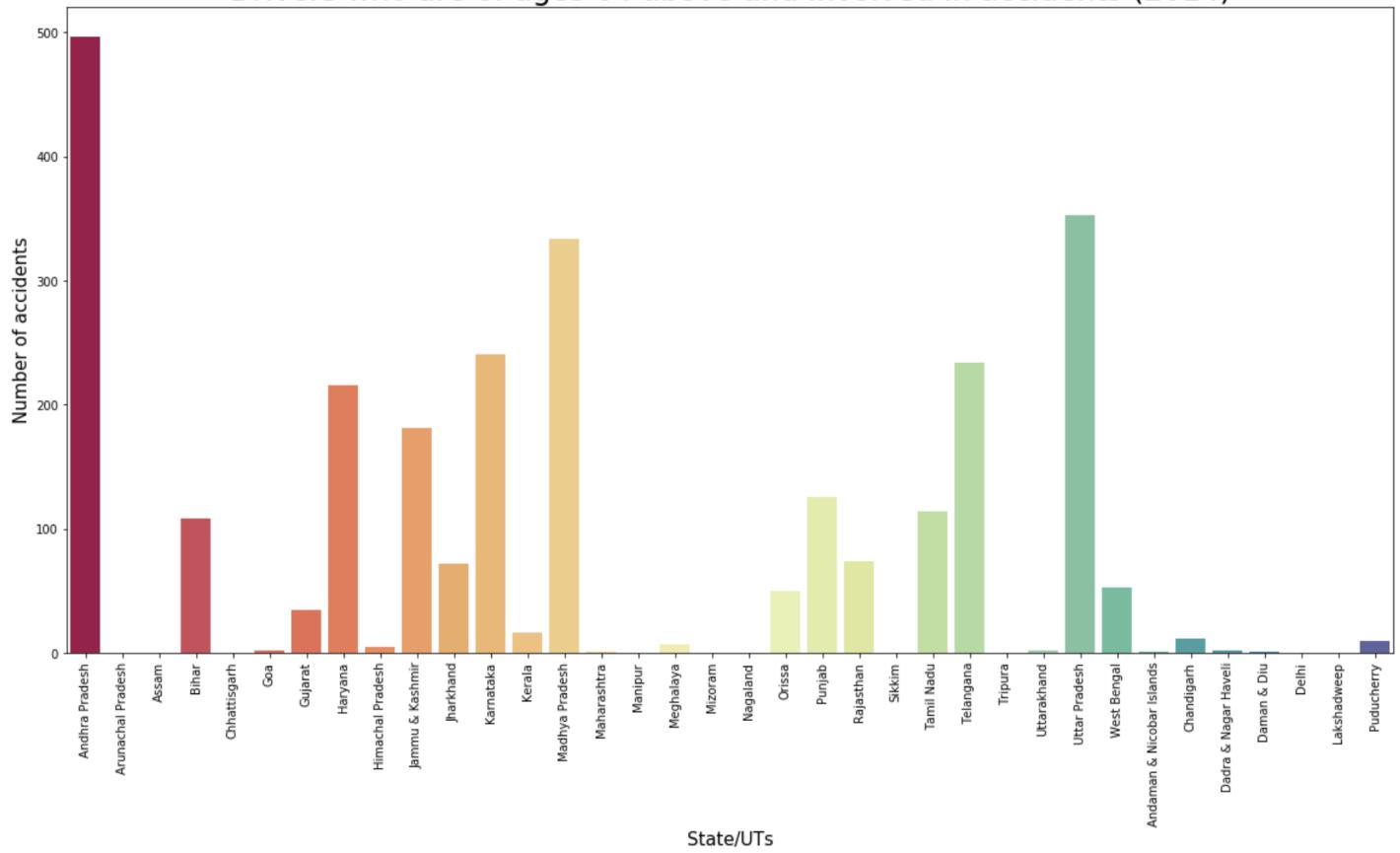
Between the ages of 15-24, most of the accidents are from Maharashtra and UP. Telangana, Andhra Pradesh, Karnataka are also a notable mention. This age group generally comprises of school going senior students or college students who use 2 wheelers. Speeding is one of the major reasons for these accidents.

Drivers who are of ages 25-64 and involved in accidents (2014)



Amongst the middle aged and retiring aged people, Andhra Pradesh , Telangana, Tamil Nadu , Maharashtra have high cases of accidents.

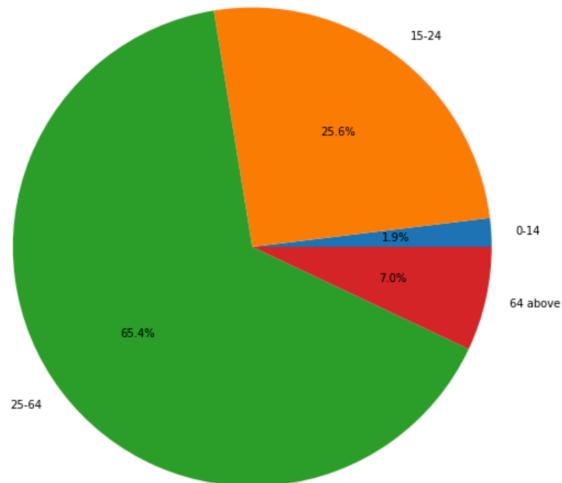
Drivers who are of ages 64 above and involved in accidents (2014)



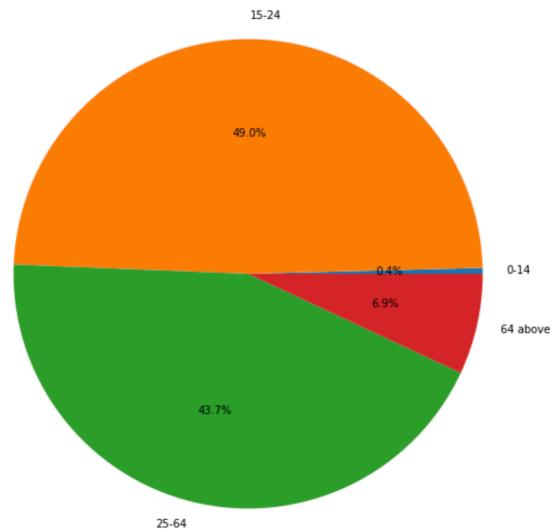
Amongst the senior citizens aswell, Andhra Pradesh records the highest cases followed by MP and UP. States having strong public transport systems such as metros and buses show low accident rates for senior citizens since they prefer it over driving themselves.

Pie chart visualisation of the above data for Maharashtra, Karnataka and Andhra Pradesh

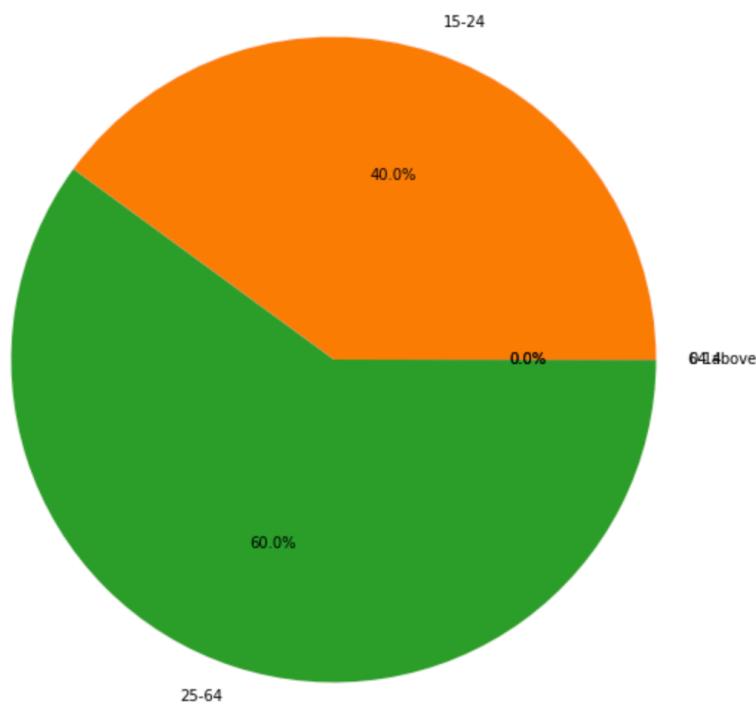
Road accidents in Andhra Pradesh by age groups (2014)



Road accidents in Karnataka by age groups (2014)



Road accidents in Maharashtra by age groups (2014)

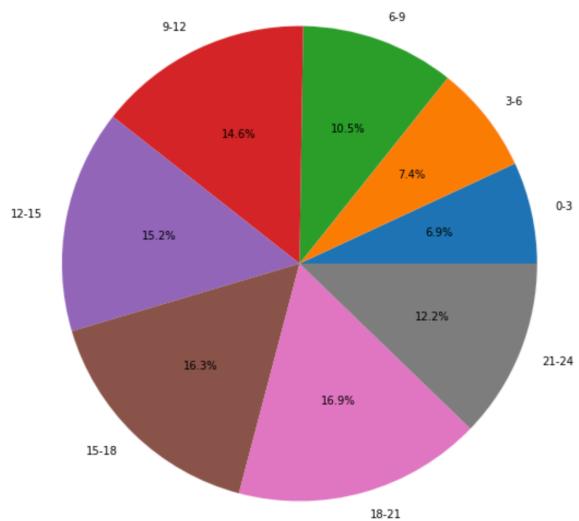


In Maharashtra, no accidents are caused by underage driving or by senior citizens. This indicates strict traffic and police regulations against under age driving.

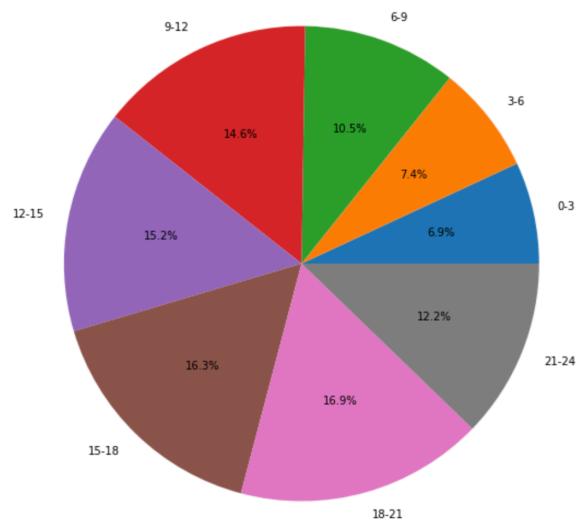
- The final factor that we will be looking into is the visibility during the time of accident.
- Visibility is always an important factor for safe driving to be possible.
- Based upon the time of accident, an estimate can be made as to what will be the visibility during the occurrence of the accident.
- The time after 6 PM (or 18 hrs) will be considered as 'poor visibility' in many states.
- Late night accidents also mean that drivers are usually under intoxication or some other influence.
- For the purpose of data visualisation, we have taken states of Andhra Pradesh, Tamil Nadu and Karnataka which are the three highest accident prone states which are shown below.

Pie charts of the states showing road accidents at different times of the day

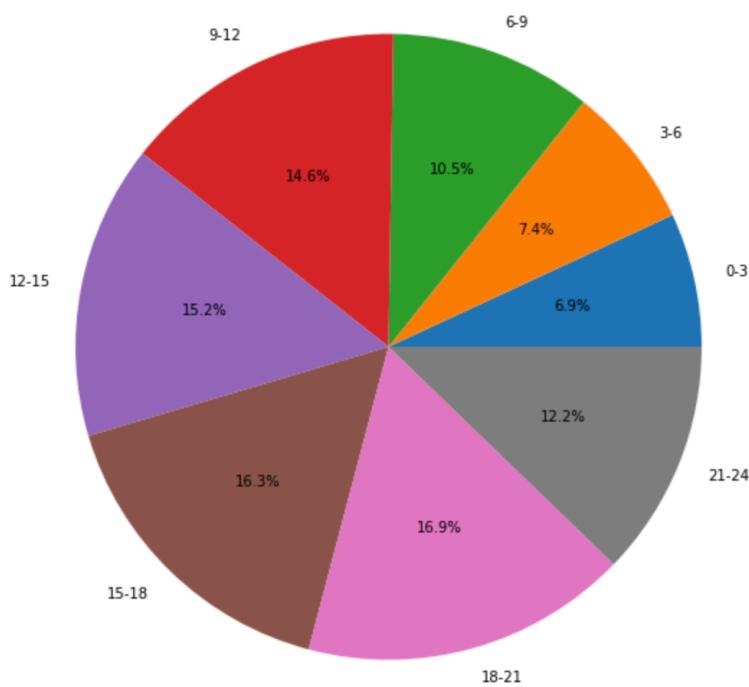
Road accidents in Karnataka by time of accident in hrs (2014)



Road accidents in Karnataka by time of accident in hrs (2014)



Road accidents in Andhra Pradesh by time of accident in hrs (2014)

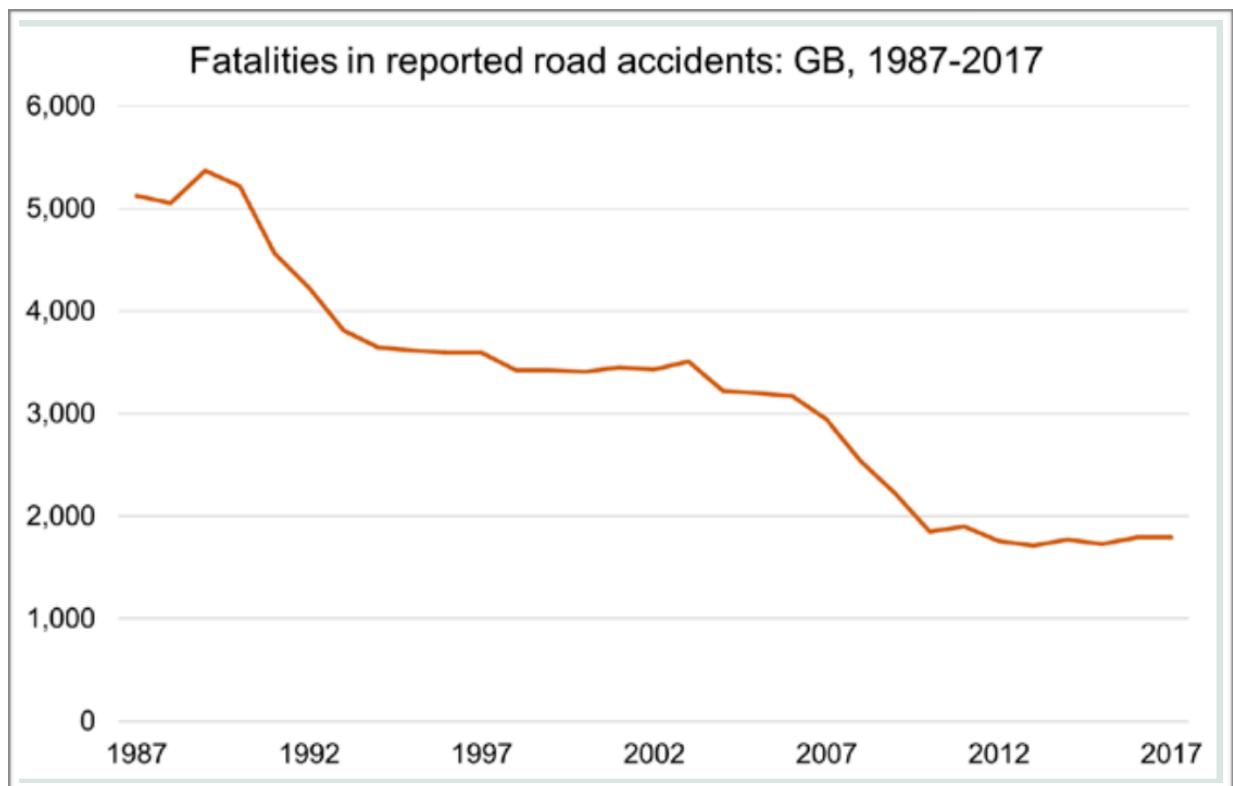


From the above, it can be seen that the accidents occurring from 18-21 hrs is slightly higher. Most of the accidents occur after sunset when the visibility might be low. This means drivers are facing issues with inadequate lighting or rash fellow drivers. Strict police patrolling to maintain speed limits could definitely help reduce accidents.

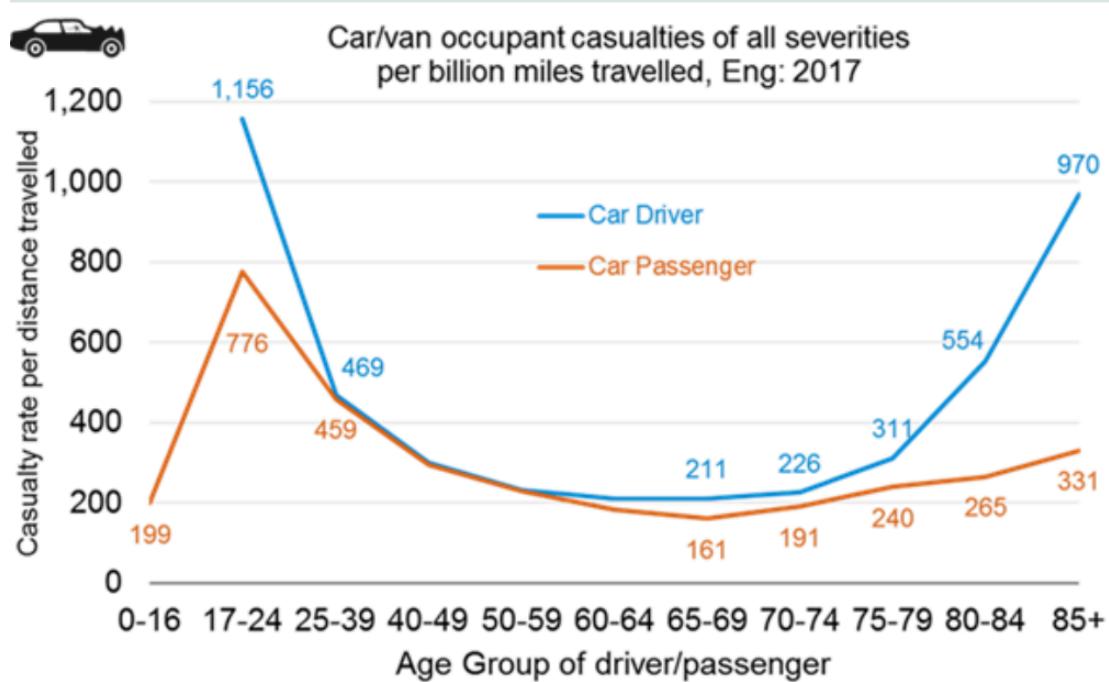
Comparative road safety case study of United Kingdom

- According to the road deaths per million population, the safest five countries in the world are Monaco, Micronesia, Kiribati, Sweden and the United Kingdom.
- In order to prevent the use of skewed data due to extremely low population density of the first four countries, a detailed understanding of the road safety features of United Kingdom is done.
- The United Kingdom has a population of about **6.6 crore** people and has a **death per million** of only **2.9** which is a great indicator of the road safety.
- The Department of Transport, Government of UK is responsible for implementing road safety.
- Over the last 30 years, UK has managed to severely lower the road casualties. In the same period, the number of road accident cases and casualties have linearly increased in India. This shows completely opposite trend and requires introspection to understand as to why.

- The curve for casualties over the last 30 years gives us a good idea of the improvement of road safety in the country.
- At the same time, it is commendable to note that they have achieved this feat even when their traffic population has increased by about 8 percent on a yearly basis.



- As we did the analysis of road accidents by age group in India, UK government has done similar to understand which age groups are actually causing the road accidents.



- Similar to what we have seen in India, a major portion of the accidents are caused by school going or college students between ages 17-24.
- Unlike India however, the aged population prefers to drive in UK due to which, high number of cases are seen in the ages of 80-84. This could be due to the reason that as a person ages beyond 80, it is difficult to be aware of their surroundings or have good reflexes to avoid road accidents.

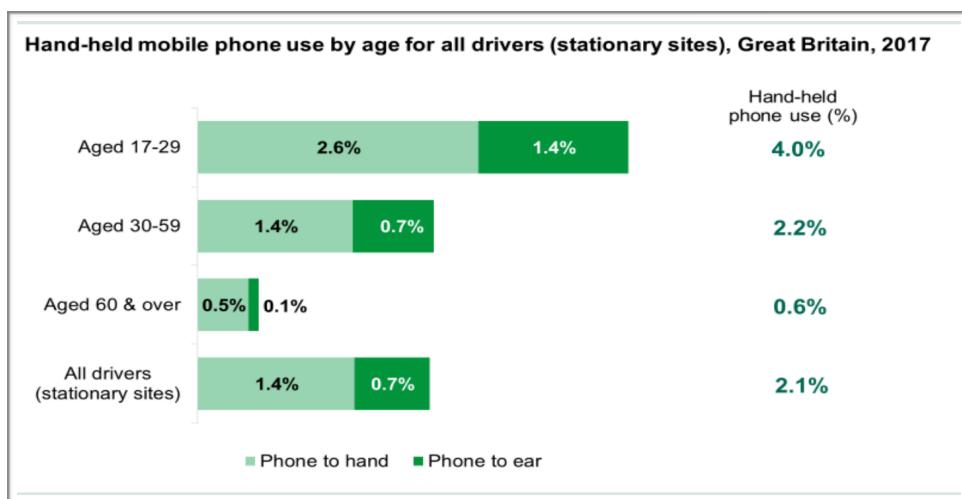
Important safety measures taken by UK government

- The government has made various school resources for students to learn practices of safe driving right from 8th standard. Many schools have also implemented augmented reality to impart safe practices on road.
 - To address the issue of child fatality during accidents, the government has funded £225,000 to Good Egg Safety to develop and deliver a nationally accredited child seat safety training programme for retailers.
- The Driver and Vehicles Standards Agency (DVSA) is responsible for implementing various behavioural changes in drivers leading to safer roads. This agency is responsible for handing out learner licenses. The criteria set for getting a full time license is based upon number of learning hours completed. The requirement of learner hours is different for each road. A learner must complete each of the below to get his full time license.
 1. **Driving on rural roads** requires at least 2 hours of driving with instructor with a passing score of 70 %.
 2. **Driving independently** for at least 4 hours with a passing score of 55 %

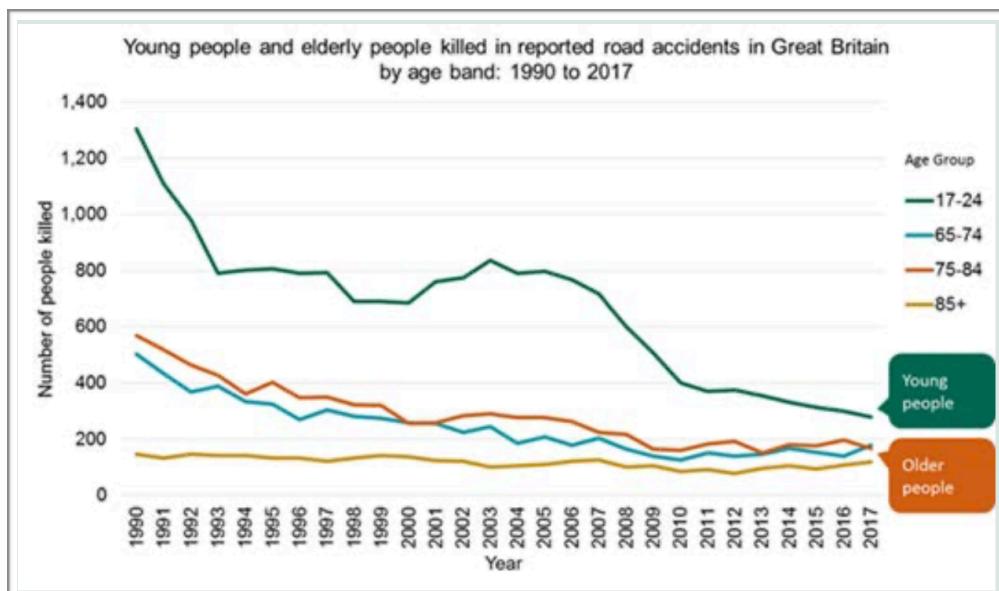
3. **Driving in the dark** for any specified time with a passing score of 82 %

- In India, according to data provided by MoRTH, close to **78 %** accidents are caused by full time license holders. Close to **10 %** drivers forged their driver licenses and remaining have been caused by learners or non license holders.
- This requires strong introspection and leaves much to be desired in the Indian driver learning program.
- The DVSA have also developed a walking and cycling safety program where pedestrians and cyclists are trained on how to use the footpaths, cycling lanes and cross roads safely.
- In the UK, licenses have a **point penalty system** which keeps getting recorded for any offence. Upon exceeding a point limit, the license is withdrawn for a fixed period of years and any further driving leads to heavy fines and even imprisonment. For a learner license, the maximum allowed points penalty is 6 points.
- Alongside failure to wear seat belts, usage of mobile phones is another major reason for cause of accidents.

- Usage of phones or failure to wear seat belts is a £200 penalty and 6 license penalty points.



- The benefit of teaching safe practices from school going and college going age has seen immense benefits in the road fatalities. This shows that a proper learner program can massively reduce the road casualties.



Measures taken by Gol to improve road safety

- Based on high number of accidents per square kilometre, identification of “**Blackspots**” is done to concentrate higher resources in rectifying the driver safety issues.
- A better driver training module is under way to be taught in 13 separate training schools all over the country. The current learner program requires a revamp.
- A sanction for 10 automated vehicle safety centres has been done. These systems will check for loose wheels, overloaded trucks, protruding loads which could lead to potential health hazards.
- Usage of breathalysers has helped to identify drivers who drive while under intoxication.
- The Gol has approved National Highway Relief fund. This relief fund includes tow away trucks, ambulances, patrolling cars.
- National Highways must include an ambulance in every 50 kms now.
- 3 pilot projects to enable cashless payments for road accident victims is underway.

Possible future improvements

- India being the home to 133 crore people, poses an extreme challenge for authorities to maintain road safety.
- The only possibility to control the ever increasing traffic population is by digitalisation and automation.
- Most of the metropolitan cities like New Delhi and Bangalore already have the technology to gather vehicle speed data using detection cameras. These cameras can capture the number plate of the vehicles and the details of the driver can be ascertained.
- These smart cameras can also be used to check if drivers are following traffic signals.
- Need to weed out all the vendors who supply cheap protective equipments with no safety standard.
- India must implement a penalty point license system as well. This will require complete revamp of the current license system but it is an extremely effective measure to track unruly drivers.
- A separate driving test for heavy and light motor vehicles exist. However, it is seen that most of the heavy motor vehicle drivers have forged their licenses and have little concern for road safety. Employers

must be heavily fined under such an event to discourage hiring drivers having no training.

- Ride hailing services like Ola and Uber along with other taxi services should keep reporting about issues they face in regards to the road safety and suggest steps to counter these issues.
- Industries and PSUs who rely heavily upon truck drivers must train their drivers to the maximum and keep a strong check on their practices with regard to road safety.

Corporate Social Responsibility

- It is extremely important to help the government in increasing the road safety.
- CSR is a special arrangement where many PSUs and top MNCs or industries come together to help the society and try to make their lives easier through monetary means.
- For a specific example, I have considered **Oil India Limited, A Navratna PSU** of Gol due to my close association with this company.
- Every year, OIL along with the District Transport Office (DTO) and Regional Transport Office (RTO) observe the road safety week from 11th January to 17th January.
- Under this program, meetings are held to see the changes in road safety over a yearly basis.
- Various safety training modules are introduced for the drivers. The drivers deemed to have the best road safety practices are awarded each year.
- A quiz on road safety is held by OIL along with other competitions such as drawing and poster making competitions to raise awareness amongst the masses.

References

- National transport policy of India, MoRTH
- Challenges and status of road safety in India, MoRTH
- Road safety policy, Government of UK
- All the data captured from the official government databases in data.gov.in