Road safety

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Analyse road traffic data over time to identify risk factors and vulnerable groups.

(and code some heatmaps in Python!)

★ What is the accident occurrence rate based on time of the day, weekdays, and months of the year?

★ What are the risk groups involved in accidents?

★ How is the distribution of accident severity?

★ What type of driver is mostly involved in accidents?

1. ACCIDENT STATISTICS
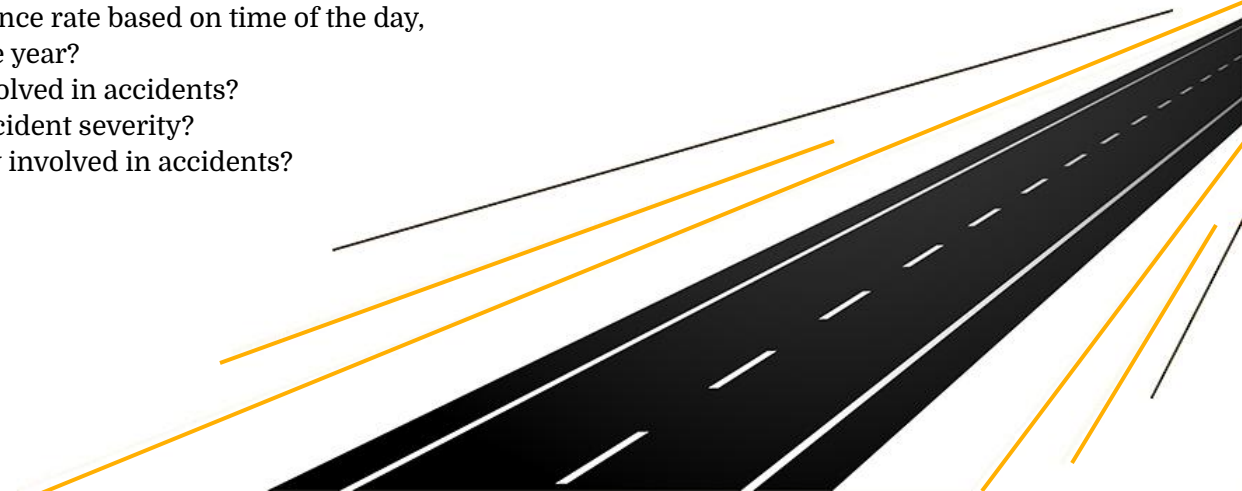
- Road class
- Road type
- Weather conditions
- Light conditions
- Road surface
- Speed limit zone
- Junction detail
- Number of vehicles
- Number of casualties
- .. and more

2. VEHICLE RECORD

- Type of vehicle
- Age of driver
- Gender of the driver
- Manoeuver
- Journey purpose
- .. and more

3. CASUALTY RECORD

- Gender and age of each casualty
- Severity of each casualty
- Casualty class (pedestrian, passenger, driver or rider)
- ... and more

GOV.UK

Timeframe:
2005- 2018

Area:
Greater Manchester

10 metropolitan boroughs: Bolton, Bury, Oldham, Rochdale, Stockport, Tameside, Trafford, Wigan, and the cities of Manchester and Salford.

Exploration - general view

Accidents and casualties between 2005-2018
Number of accidents and number of casualties is declining
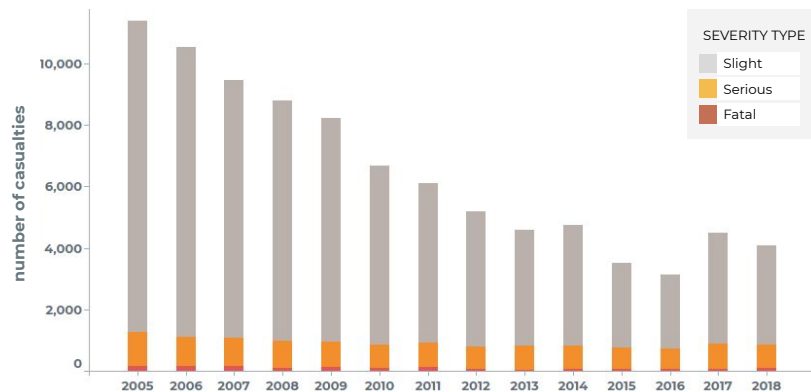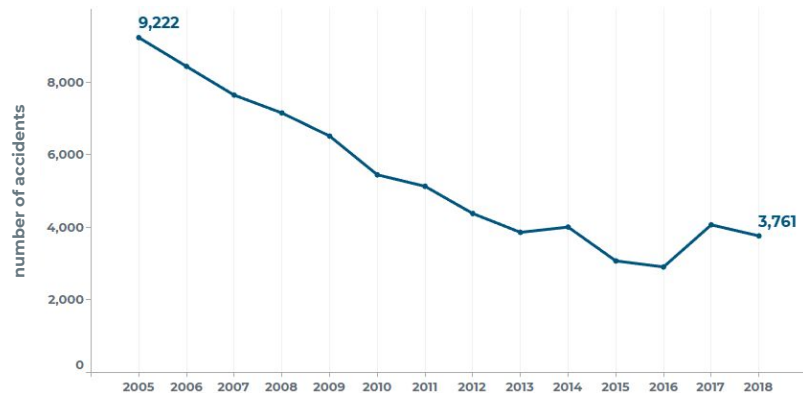
Accidents severity type between 2005-2018
Less accidents, but different distribution of severity types

Severity type — Slight — Serious — Fatal
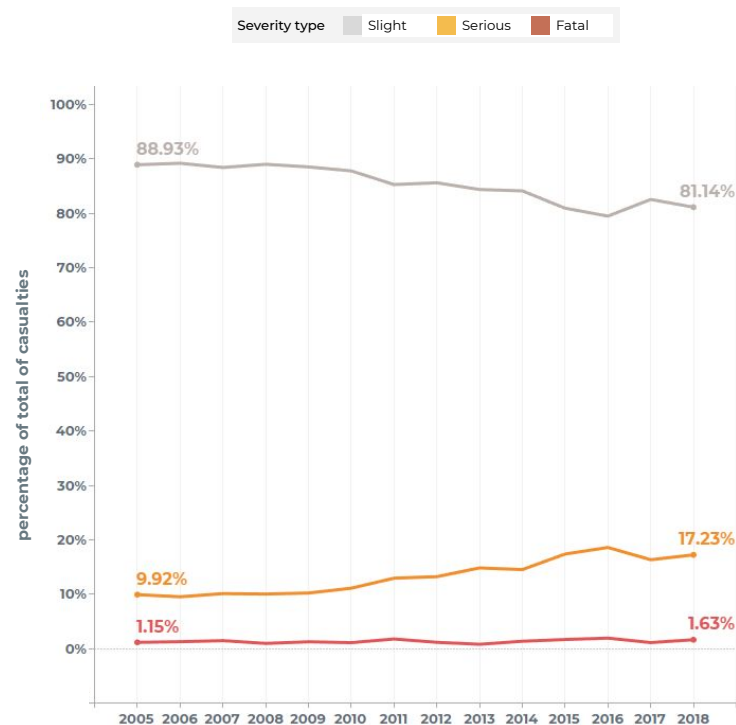
Keep in mind number of casualties on the roads DECLINE in numbers

Gender of the drivers involved in accidents

Female 32%

Male 61%

GENDER
- Male
- Female
- Unknown
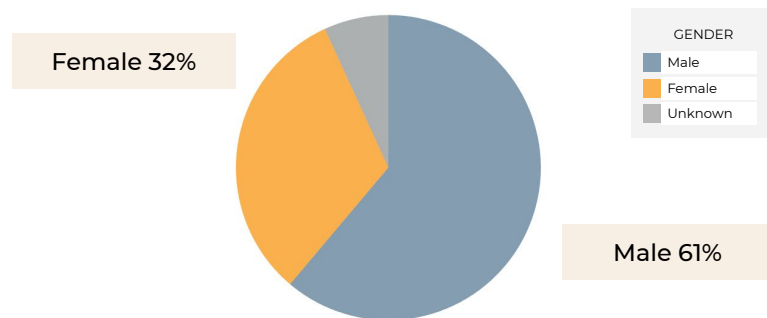
*There are around 7073 accidents in the dataset with unknown drivers gender and 8838 accidents with unknown age band.

Gender of the driver involved in accidents within age groups

number of accidents

35,000
30,000
25,000
20,000
15,000
10,000
5,000
0

0 - 5   6 - 10   11 - 15   16 - 20   21 - 25   26 - 35   36 - 45   46 - 55   56 - 65   66 - 75   Over 75

GENDER
- Male
- Female

*Unknown gender and age removed
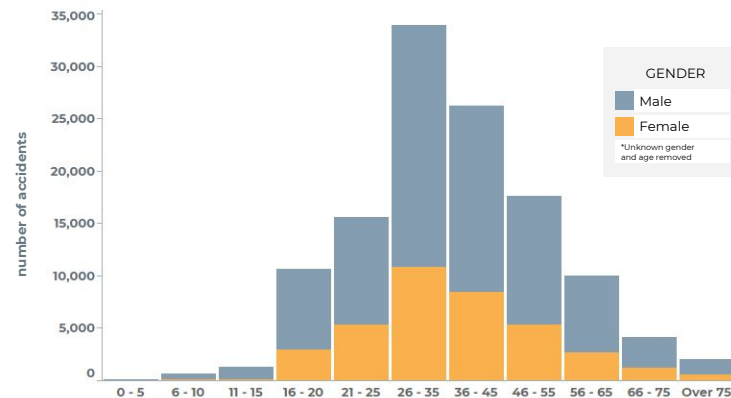
Who was involved in accidents?
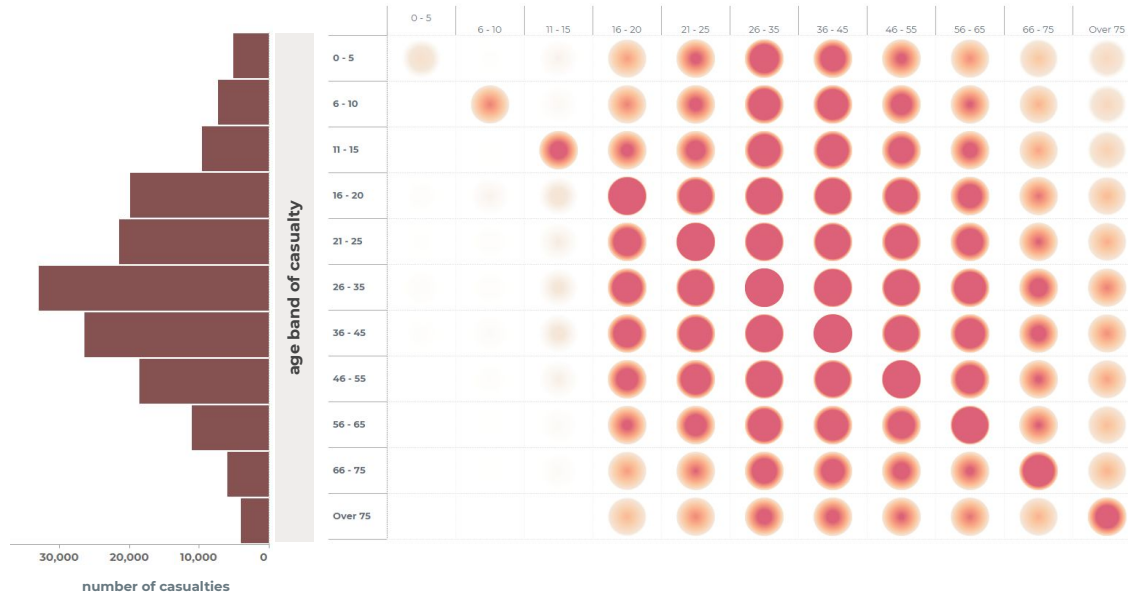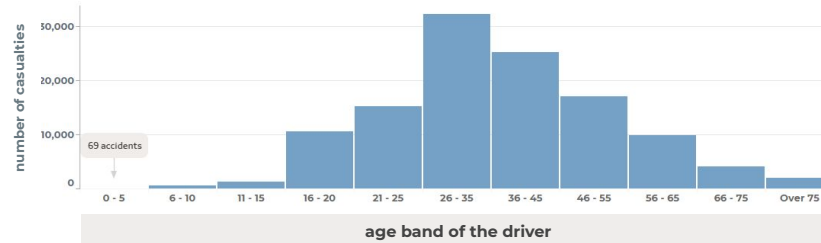
Most dangerous time during the day
number of casualties
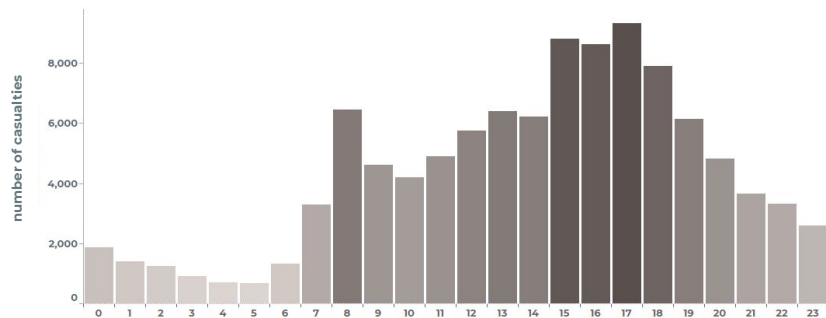
Distribution of accidents per month and weekdays

ROAD TYPE

LIGHT CONDITIONS

VEHICLE TYPE

SPEED LIMIT
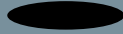
WEATHER CONDITIONS

JUNCTION DETAIL

Exploring risk factors - examples
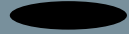
SPEED LIMIT

30 miles per hour speed limit zone
accidents numbers and severity type

Severity type   Slight   Serious   Fatal

30

50
km/h

20 miles per hour speed limit zone
accidents numbers and severity type

Severity type   Slight   Serious   Fatal

20

30
km/h
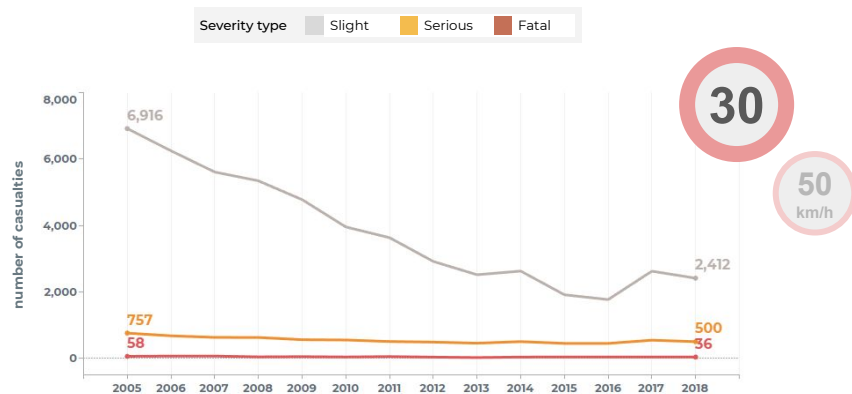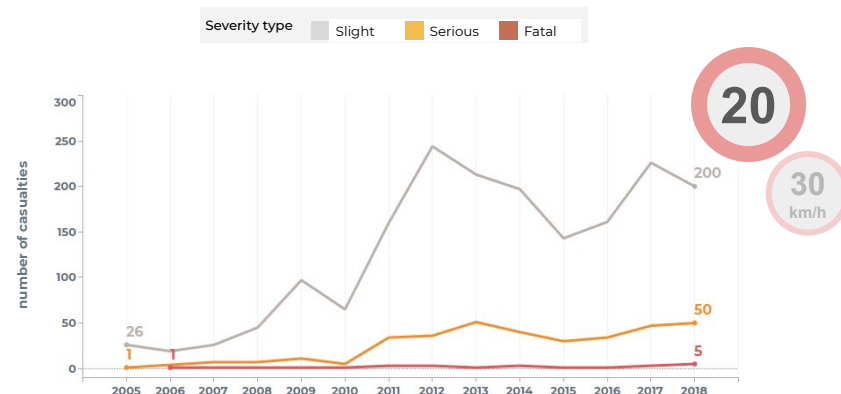
What are the most common casualty types?

Casualty class involved in accidents

67.86% — Driver or rider
25.44% — Passenger
23.00% — Pedestrian
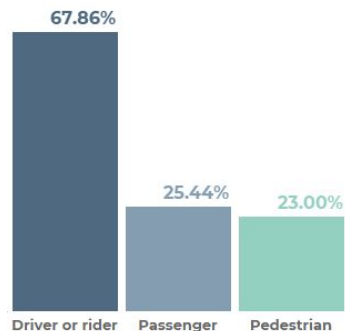
Number of casualties in age groups

number of casualties vs age band of casualty

3,451

Age bands: 0 - 5, 6 - 10, 11 - 15, 16 - 20, 21 - 25, 26 - 35, 36 - 45, 46 - 55, 56 - 65, 66 - 75, Over 75
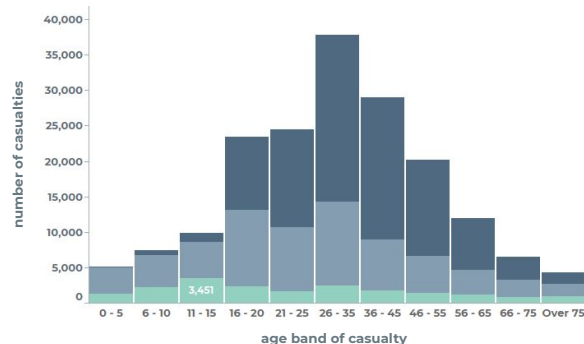
Gender of casualty in age groups

number of casualties vs age band of casualty

GENDER
Male
Female

Age bands: 0 - 5, 6 - 10, 11 - 15, 16 - 20, 21 - 25, 26 - 35, 36 - 45, 46 - 55, 56 - 65, 66 - 75, Over 75

Top 10 causality types

Car occupant
Pedestrian
Cyclist
Motorcycle 125cc and under
Motorcycle over 500cc rider or passenger
Taxi/Private hire car
Bus or coach (17 or more pass seats)
Van / Goods vehicle (3.5 tonnes mgw or under) occupant
Motorcycle 50cc and under
Motorcycle over 125cc and under 500cc rider or passenger

casualties number

SEVERITY TYPE
Slight
Serious
Fatal

What is the most vulnerable group?

Serious & fatal casualties numbers
for selected casualty types

CASUALTY TYPE

- Pedestrian
- Car occupant
- Cyclist
- Motorcycle over 500cc rider or passenger
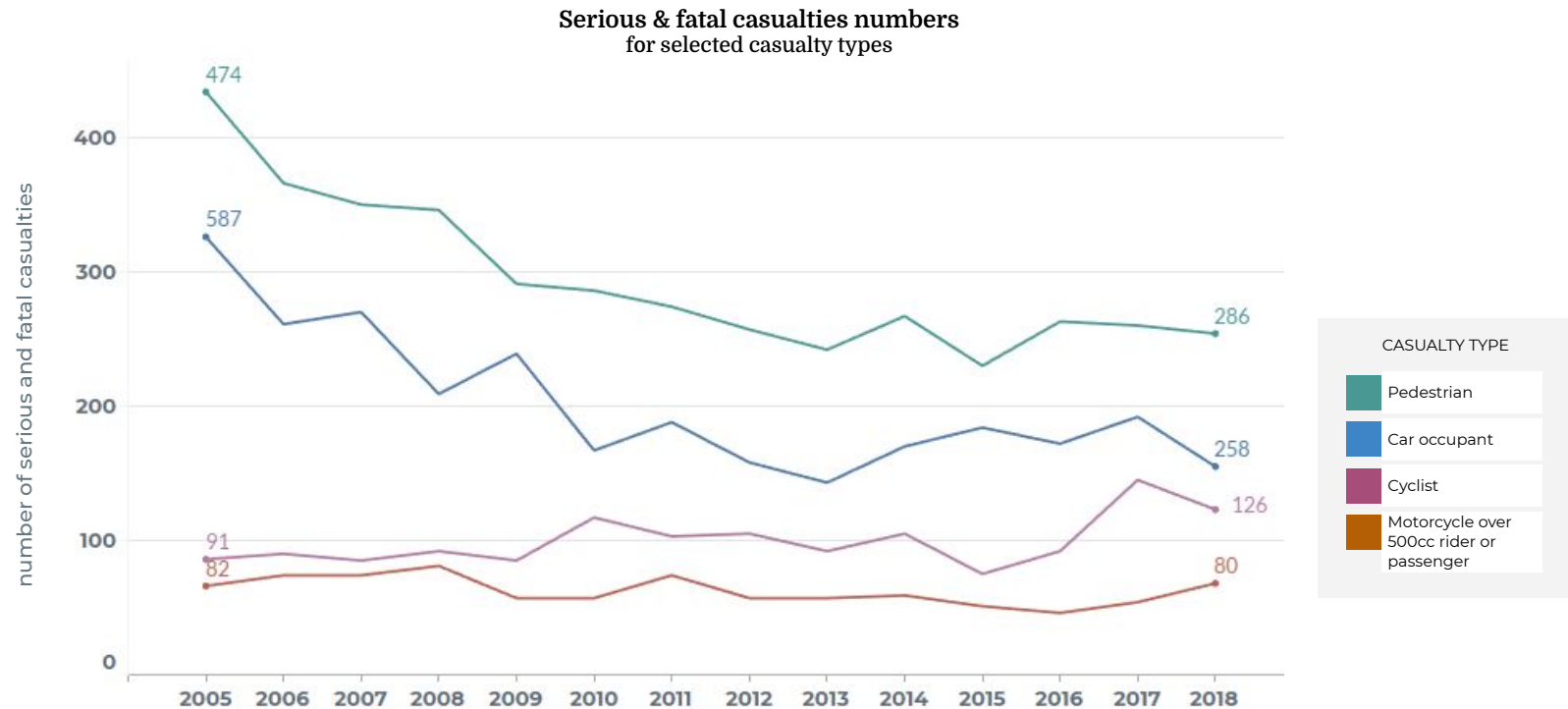
What is the driver doing just before the accident?

Top 10 maneuvers for all accidents

Severity type | Slight | Serious | Fatal

Maneuver	
Going ahead other	
Turning right	
Waiting to go - held up	
Slowing or stopping	
Parked	
Turning left	
Moving off	
Going ahead right-hand bend	
Going ahead left-hand bend	
Waiting to turn right	

0   10,000   20,000   30,000   40,000   50,000   60,000   70,000   80,000

casualties number
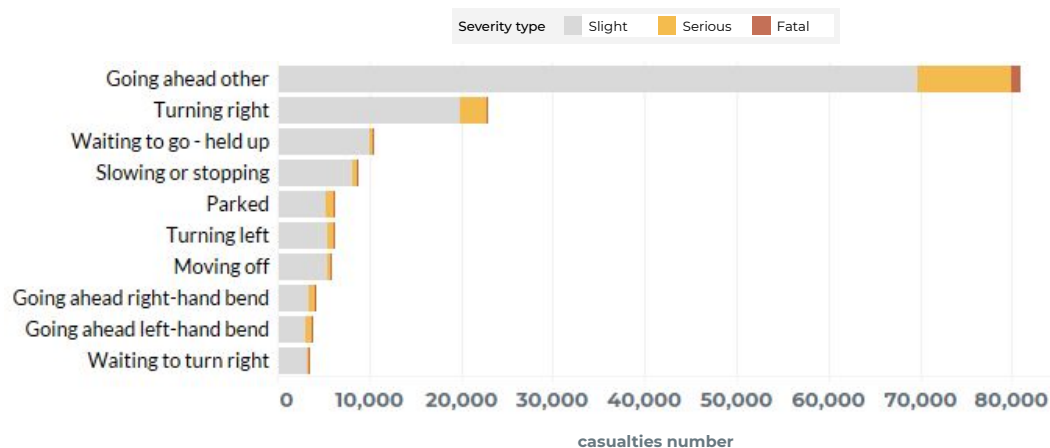
Most dangerous maneuvers involving cyclist casualty

Top 5 maneuvers for accidents involving a cyclist casualty

Severity type: Slight | Serious | Fatal

- Going ahead other
- Turning right
- Turning left
- Moving off
- Parked

casualties number
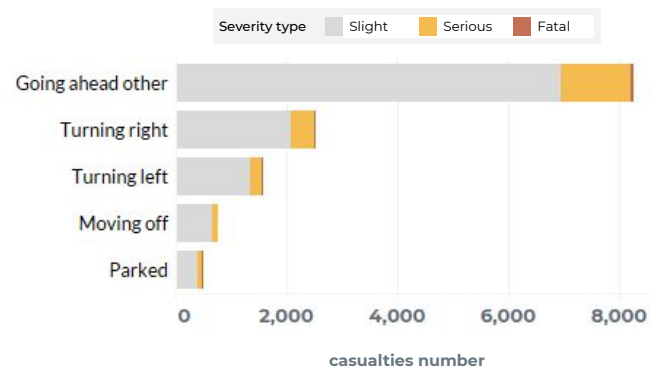
Top 5 maneuvers for accidents when cyclist was killed

Severity type: Fatal

- Going ahead other
- Turning left
- Turning right
- Going ahead right-hand bend
- Changing lane to right

casualties number

Turn right UK

Happens more often

Turn left UK
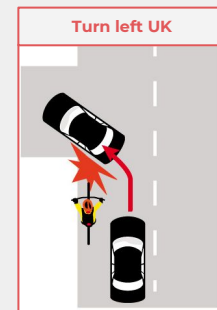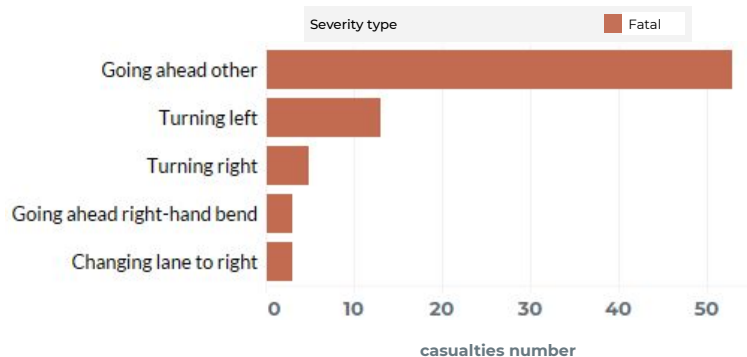
More cyclist killed

Accidents and casualties within the local districts
Manchester district reports almost 25% of total accidents in the area

Districts (left to right): Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford, Wigan

Manchester Accidents: 19,112
Manchester Casualties: 26,336

Legend:
- Accidents
- Casualties
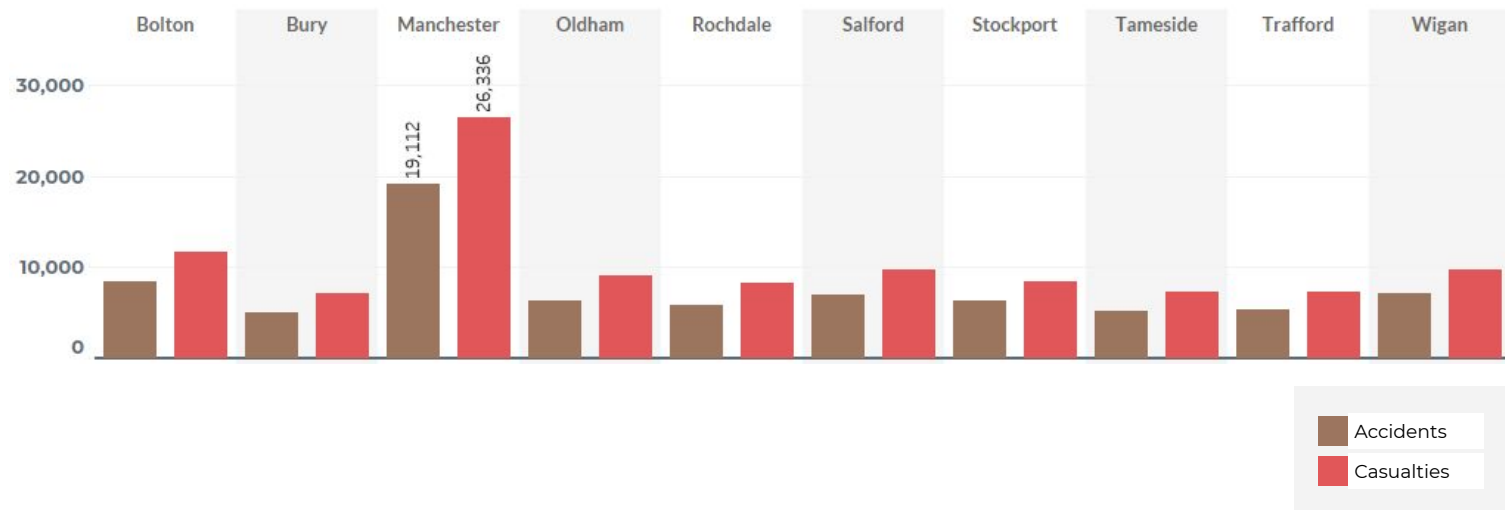
Accidents within 30 miles per hour speed limit zone

Example of heatmaps for 2005 and 2018
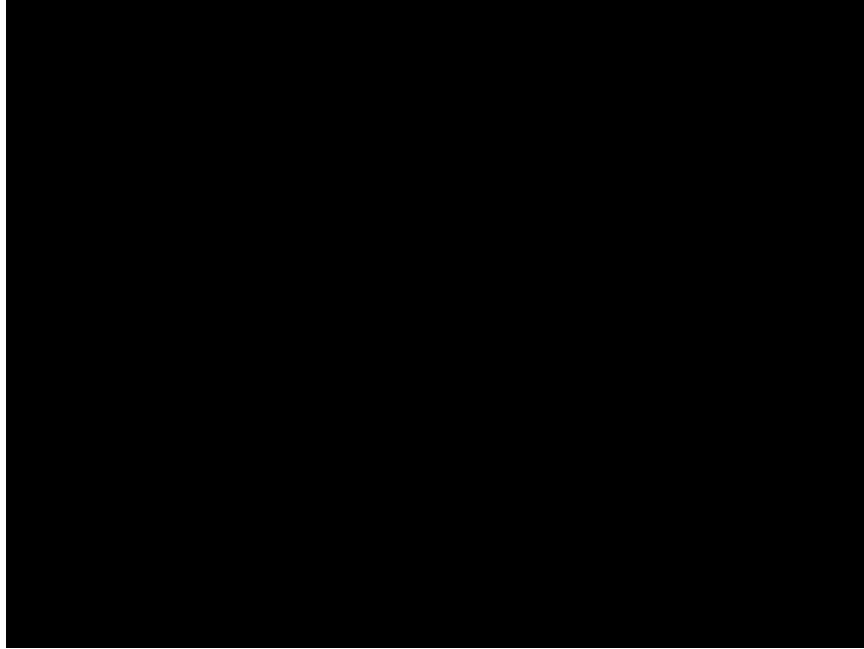
12 months of 2005

12 months of 2018

Conclusions

★ **Total number of accidents has been steadily declining over the last 14 years**
  - Fatal casualties dropped by 40%

★ **Majority of the accidents involve slight casualty**
  - 81% of the accidents in 2018

★ **Cities and urban areas are still more dangerous than rural areas**
  - City of Manchester reports 25% of total accidents

★ **Most vulnerable groups involved in accidents are pedestrians, cyclists and motorcycle riders**
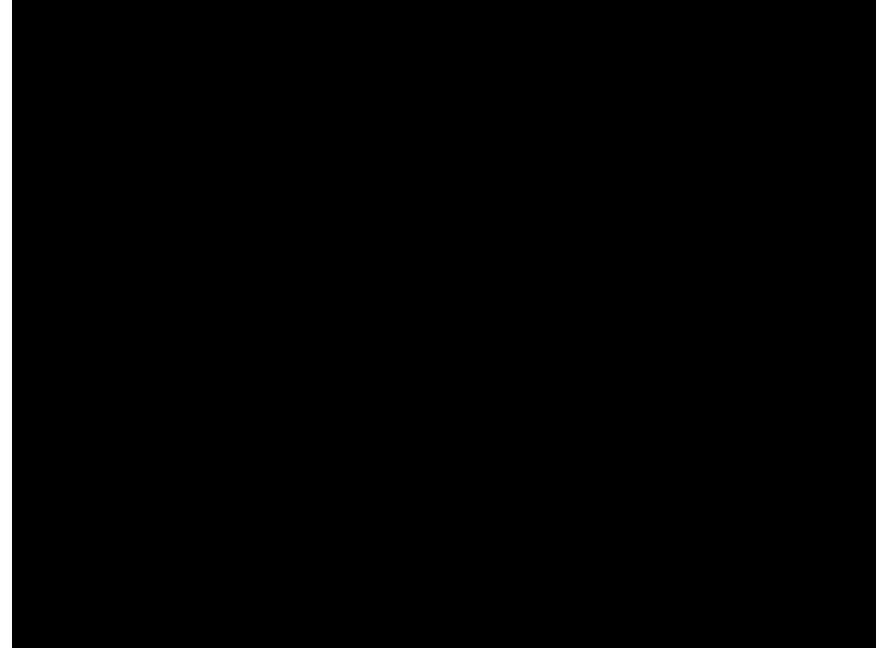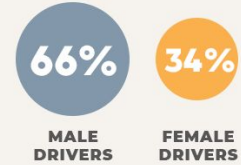 - 23% of all accidents involve pedestrians
  - Almost 40% of total deaths were pedestrians

★ **75% of total accidents involved any of the drivers going ahead other and 20% of total accidents turning right**

WHO WAS INVOLVED IN ACCIDENTS?

27% of drivers were between 26 and 35 years old

40% of all fatal casualties were PEDESTRIANS

13% of casualties were children below 16 years old

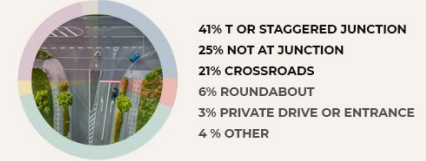**66%** MALE DRIVERS

34% FEMALE DRIVERS

WHERE DID ACCIDENTS OCCUR?

ROAD TYPE
72% SINGLE CARRIAGEWAY
18% DOUBLE CARRIAGEWAY
5% ROUNDABOUT
2% ONE WAY STRET
1% SLIP ROAD
2% UNKNOWN

JUNCTION TYPE
41% T OR STAGGERED JUNCTION
25% NOT AT JUNCTION
21% CROSSROADS
6% ROUNDABOUT
3% PRIVATE DRIVE OR ENTRANCE
4 % OTHER

WHAT CONDITIONS?

DAY OR NIGHT
58% DAYLIGHT
42% DARKNESS

WEATHER CONDITIONS
77% FINE
16% RAIN
1% SNOW
2% OTHER
4% UNKNOWN
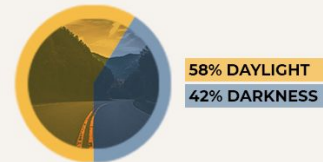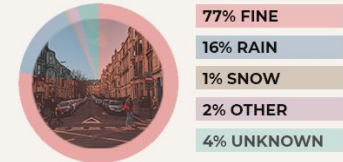
Interesting data to follow up...

★ Investigate maneuvers types and accident severity in different casualties classes

   ○ **What is the most dangerous car maneuver for accidents involving pedestrians?**

   ○ **Are cyclists involved in more accidents while doing a specific maneuver?**

Thank you