Road Traffic Accidents Data Analysis using R

Student ID: 201081646

1 Introduction

This report is the second assessment of the **MATH5741M Statistical Theory and Methods** module. Its aim is to answer three questions through inferential statistical analysis regarding a road traffic accidents dataset from 2005 collected by the UK Department for Transport.

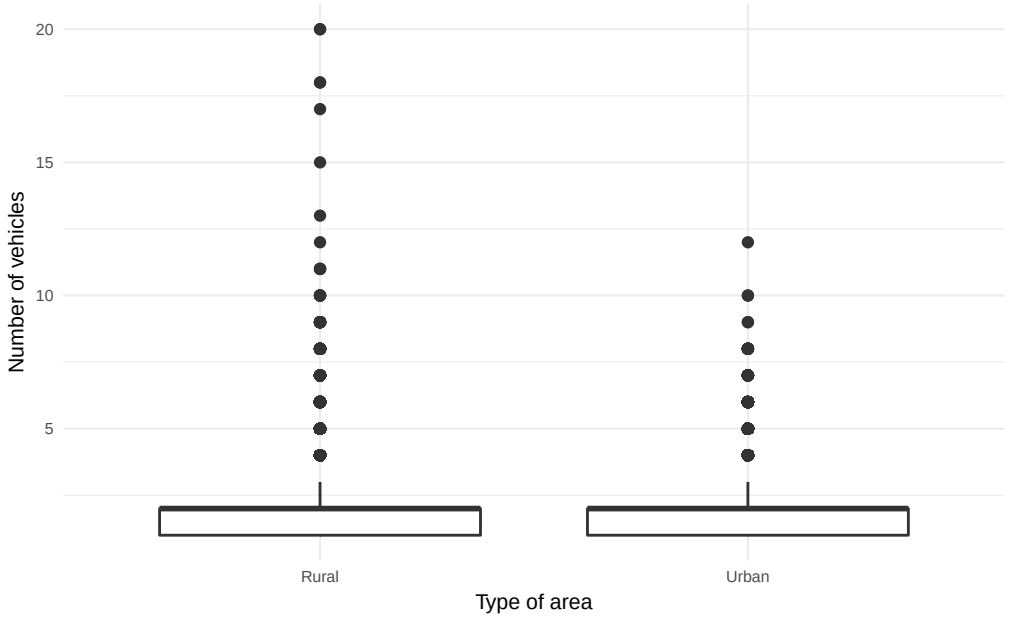
All the analysis has been done using **R** (programming language) and is code reproducible. To see the complete **R** coding process visit https://github.com/eugenividal/Road-Traffic-Accidents-Data-Analysis

2 Results

2.1 Question 1

In this question, first, we are asked to draw a boxplot to compare the number of vehicles involved in urban areas with the number invlolved in rural areas. Secondly, we have to carry out a test to investigate whether the average number of vehicles in an accident differs per type of area.

To plot the boxplot, we first remove the unallocated values.



In the boxplot is difficult to appreciate what is going on. We cannot appreciate the median and the box is very thin. This shows the data is not symetric. TO be certain, we visualise the data with a histogram (H1 in figure 2). Because it is very skewed to the right, we take the log10 and see that it substantially improves (See H2 in figure 2).

Now, we plot our boxplot with the log10 in y axis.

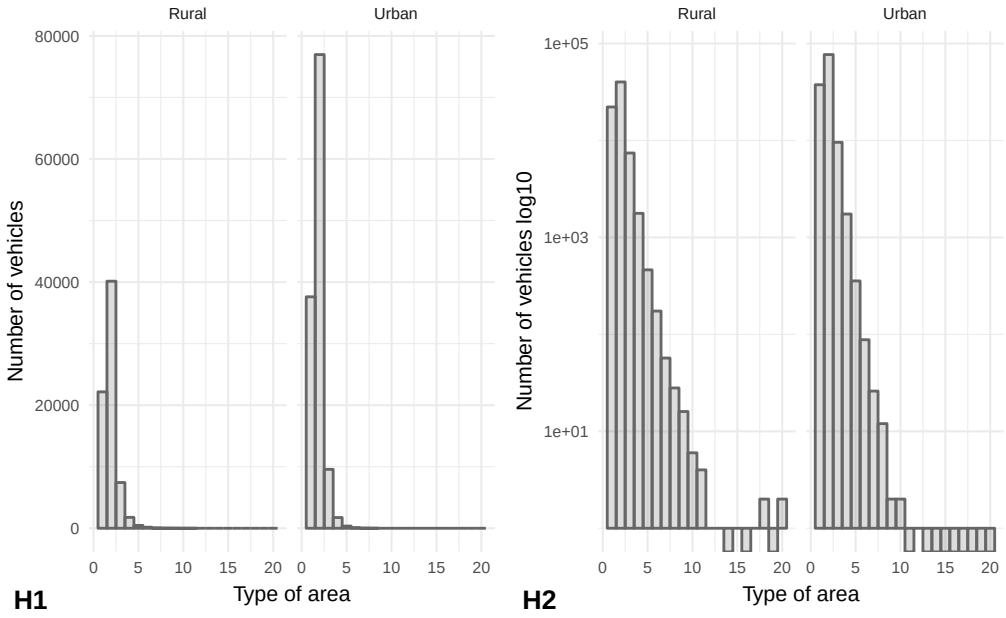


Figure 1: Histograms

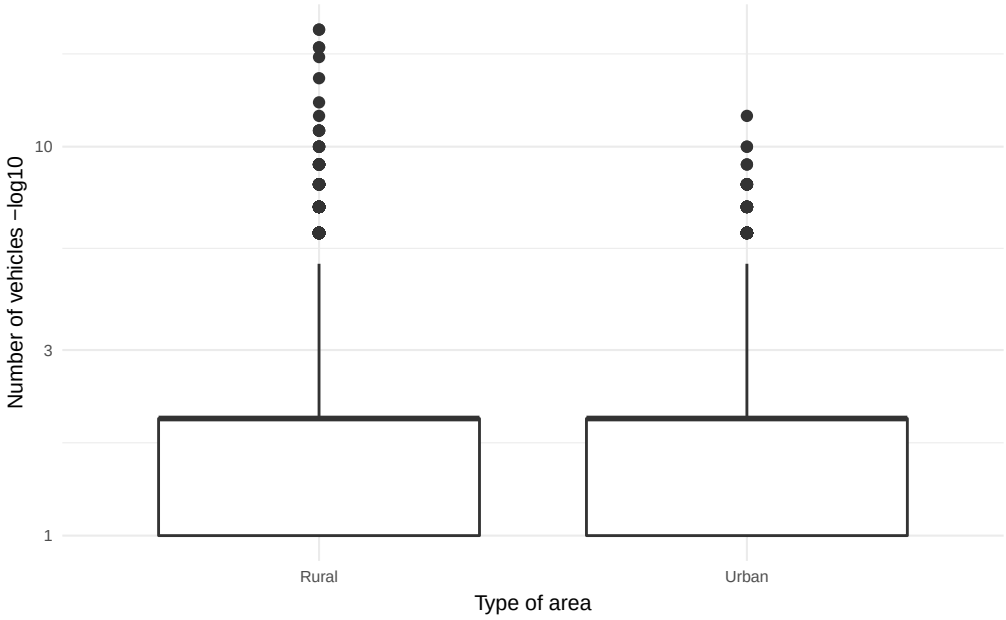


Figure 2: Number of vehicles involved grouped by type of area

It is not very well, but it has imrpoved significantly. However from the boxplot we cannot be sure that the populations differ.

So, we carry out a test to investigate wheter the average number of vehicles in an accident differs per type of area.

Determination of hypotheses:

$$H_0 : \mu_{urban} = \mu_{rural} \quad vs. \quad H_1 : \mu_{urban} \neq \mu_{rural}$$

The summary statistics are this summary()

It seems reasonable to assume $\sigma_1^2 = \sigma_2^2$ and so we estimate the common variance with a two-sided test for two-sample poblems (*pooled estimate*).

The test statistics is then:

We do not reject the null hypotesis and conclude that $\mu_{urban} = \mu_{rural}$.

2.2 Question 2

In this question, first, we have to investigate whether the frequency of accidents varies by day of the week using the suitable statistical hypothesis test.

For this, we apply a **chi-squared test**. Check example p.91.

http://www.jbstatistics.com/chi-square-tests-for-one-way-tables/

Next, we are required to do the same test using only week-days (excluding Saturday and Sunday).

2.3 Question 3

Finally, in question 3, we are asked to compute a 95% confidence interval for the expected (mean) number of accidents which occur on a Monday.

Look at example in p.62 to answer this:

- The data is clearly not normal. The distribution is discrete and very skewed to the right. The table of values is:
- The sample is huge (n= 198,735) so the central limit theorem stats that the sample mean in normallly distributed (even when the data are not).
- However, we need to think - for which population are we estimating a mean for?.

Is this a simple t-distribution confidence interval? WE could say that because the sample is that bing could be just a normal confidence interval?

```
# Select data using only week-days
xx_mon<- xx%>%
  select(Day_of_Week, Date, count)%>%
  filter(Day_of_Week=="Monday")%>%
  group_by(Date)%>%
  summarise(n = sum(count))
```

```
#t.test(Mondays, conf.level = 0.95)$conf.int
t.test(xx_mon$n)$conf.int
```

```
## [1] 508.9586 560.7337
## attr(,"conf.level")
## [1] 0.95
```

3 Bibliography

The resources used to carry out this project were:

- Balka, J. 2013. JBStatistics: Making Statistics Make Sense. Available from: http://www.jbstatistics.com.

- Lane, D.M. 2018. Online Statistics Education: An Interactive Multimedia Course of Study. Available from: http://onlinestatbook.com/.
- Taylor, C. 2017. MATH5741M: Statistical Theory and Methods. Outline Lecture Notes.
- Yau, C. 2018. R tutorial: an R introduction to statistics. Available from: http://www.r-tutor.com