Your Document Title

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15 April, 2024

R Markdown

```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.
## v dplyr     1.1.3     v readr     2.1.4
## v forcats   1.0.0     v stringr   1.5.0
## v lubridate 1.9.3     v tibble    3.2.1
## v purrr     1.0.2     v tidyr     1.3.0
## corrplot 0.92 loaded
##
## Loading required package: gridExtra
##
## [conflicted] Will prefer dplyr::filter over any other package.
## [conflicted] Will prefer dplyr::lag over any other package.
```

Introduction

We as human beings like to divide actions into moral and amoral. Some of these amoral actions, such as murder, theft and fraud, are codified in law and we call those transgressions crimes. It is in our best interest to avoid crime happening. Therefore, we try to punish those that commit them in hopes of it being a deterrent for future repetition. However, there might be other ways in which to minimise crime. In addition, we see that crime isn't happening uniformly everywhere. This leads us to the question: what makes a crime more likely to happen in a region?
Clay[1857], concentrating on crime in England, analysed the following characteristics: Beer-(ale)-house numbers, worship attendance and public school attendance. The argument he provides for the latter two, is both allow for the public access to Christian moral values (although he criticises that the ability to read on its own is not enough). It is to note, the "public schools" mentioned by Clay concentrated mostly on teaching read and writing and were not free but accepted anyone who could effort it. In the case of beer-houses, he argues "the temptation to animal pleasure" corrupts a person. To help his case he tries to show the positive correlation of beer-houses, the negative correlations of public school and worship attendance to crime.

In this paper we want to verify (or deny) these effects of the aforementioned characteristics and try to predict crime rate from them using the same data set. However, before starting it is important to mention, as noticed by Clay[1857], the recorded crime rate may be inaccurate because of systematic reasons since each county handles crime and punishment differently on the executive and juridical levels. This will impact the accuracy of all possible analysis and models.

Exploratory Data Analysis

We begin our analysis with a look at the first few lines of our dataset.

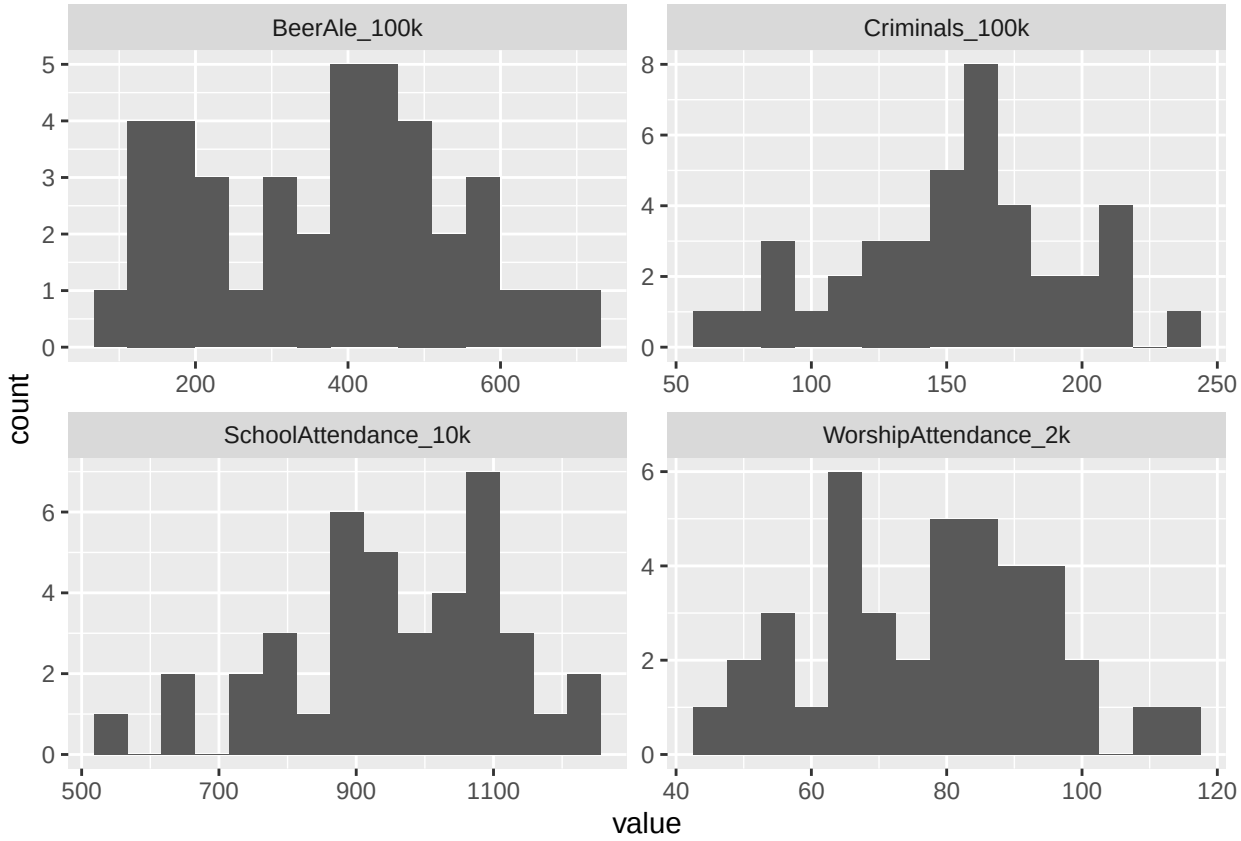
```
##
## First few data elements:
```

```
## 'data.frame':    40 obs. of  7 variables:
##  $ County              : chr  "Middlesex" "Surrey" "Kent" "Sussex" ...
##  $ RegionName          : chr  "SouthEastern" "SouthEastern" "SouthEastern"
##  $ RegionCode          : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ Criminals_100k      : int  200 160 160 147 178 205 183 156 173 132 ...
##  $ BeerAle_100k        : int  541 504 552 295 409 568 708 624 463 408 ...
##  $ SchoolAttendance_10k: int  560 630 790 820 990 930 1020 1130 950 1090 .
##  $ WorshipAttendance_2k: int  43 48 68 67 79 69 88 97 84 97 ...
```

```
## Data summary:
```

```
##     County           RegionName          RegionCode   Criminals_100k
##  Length:40          Length:40          Min.   :1.00   Min.   : 66.0
##  Class :character   Class :character   1st Qu.:1.00   1st Qu.:127.0
##  Mode  :character   Mode  :character   Median :3.00   Median :157.5
##                                        Mean   :3.45   Mean   :152.9
##                                        3rd Qu.:5.00   3rd Qu.:174.2
##                                        Max.   :8.00   Max.   :241.0
##   BeerAle_100k   SchoolAttendance_10k WorshipAttendance_2k
##  Min.   : 87.0   Min.   : 560.0       Min.   : 43.0
##  1st Qu.:209.0   1st Qu.: 880.0       1st Qu.: 65.0
##  Median :407.0   Median : 965.0       Median : 79.5
##  Mean   :374.9   Mean   : 957.8       Mean   : 77.5
##  3rd Qu.:490.8   3rd Qu.:1082.5       3rd Qu.: 91.0
##  Max.   :708.0   Max.   :1250.0       Max.   :113.0
```

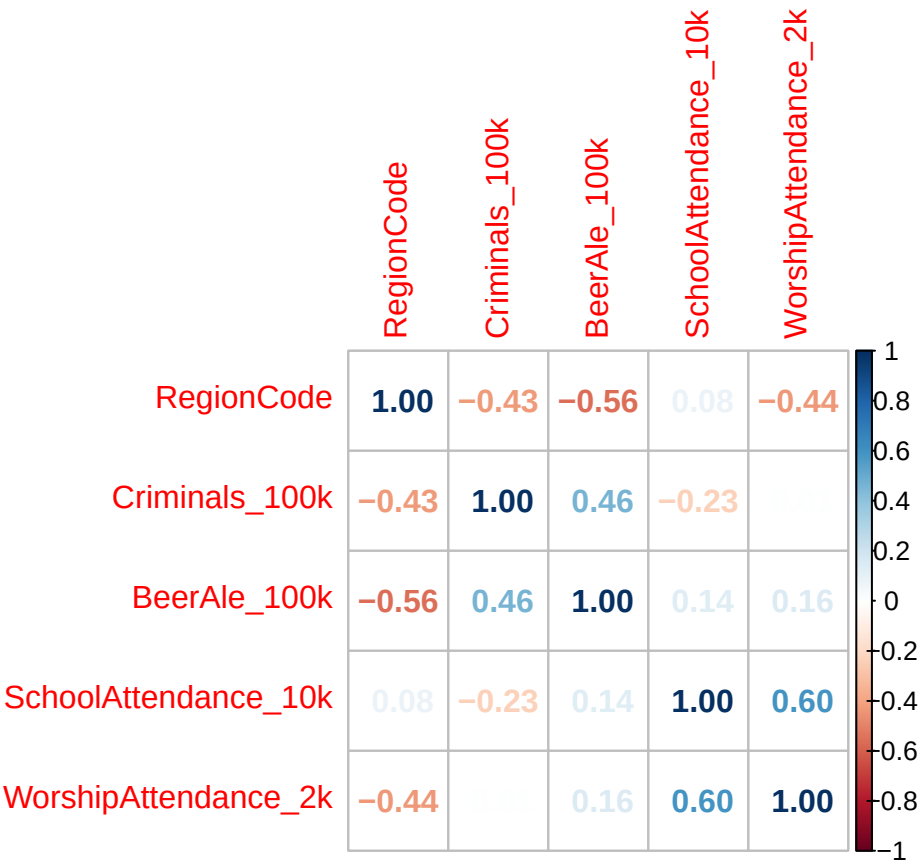
The dataset contains information about 40 different counties.`County` and `RegionName` are categorical variables, and each of the 8 regions is assigned a `RegionCode`, which is a number from 1 to 8. `Criminals_100k` is the number of criminals per 100,000 inhabitants for any particular county. Similarly, `BeerAle_100k`, `SchoolAttendance_10k` and `WorshipAttendance_2k` are social indicators measured numerically as a proportion of the population. In order to better visualise the numerical data, we plot histograms of each numerical variable, with the exception of the categorical



`RegionCode`.

The `BeerAle_100k` variable appears to be bimodal. The histogram suggests that there are two common levels of alcohol consumption within the entire population, one around the 200, and another around 400 per 100,000 population. According to the data summary, `Crimanals_100k` has a mean of 152.9 and a median of 157.5, suggesting the symmetry that is also reflected in the histogram. `SchoolAttendance_10k` is slightly left skewed, while `WorshipAttendance_2k` has a varied but loosely symmetric distribution.

The linear dependence between each pair of numeric variables is expressed in the following correlation



matrix:

There appears to be negligible linear dependence between worship attendance and criminality. School attendance is slightly negatively correlated with the prevalence of crime. Criminal behaviour is positively correlated with `BeerAle_100k` with a correlation coefficient of 0.46, suggesting that counties with a more dominant culture of frequenting bars and pubs are also where more crime happens. In order to better visualise these dependencies, we regress `Criminals_100k` on each of these variables.

```
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
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## `geom_smooth()` using formula = 'y ~ x'
```

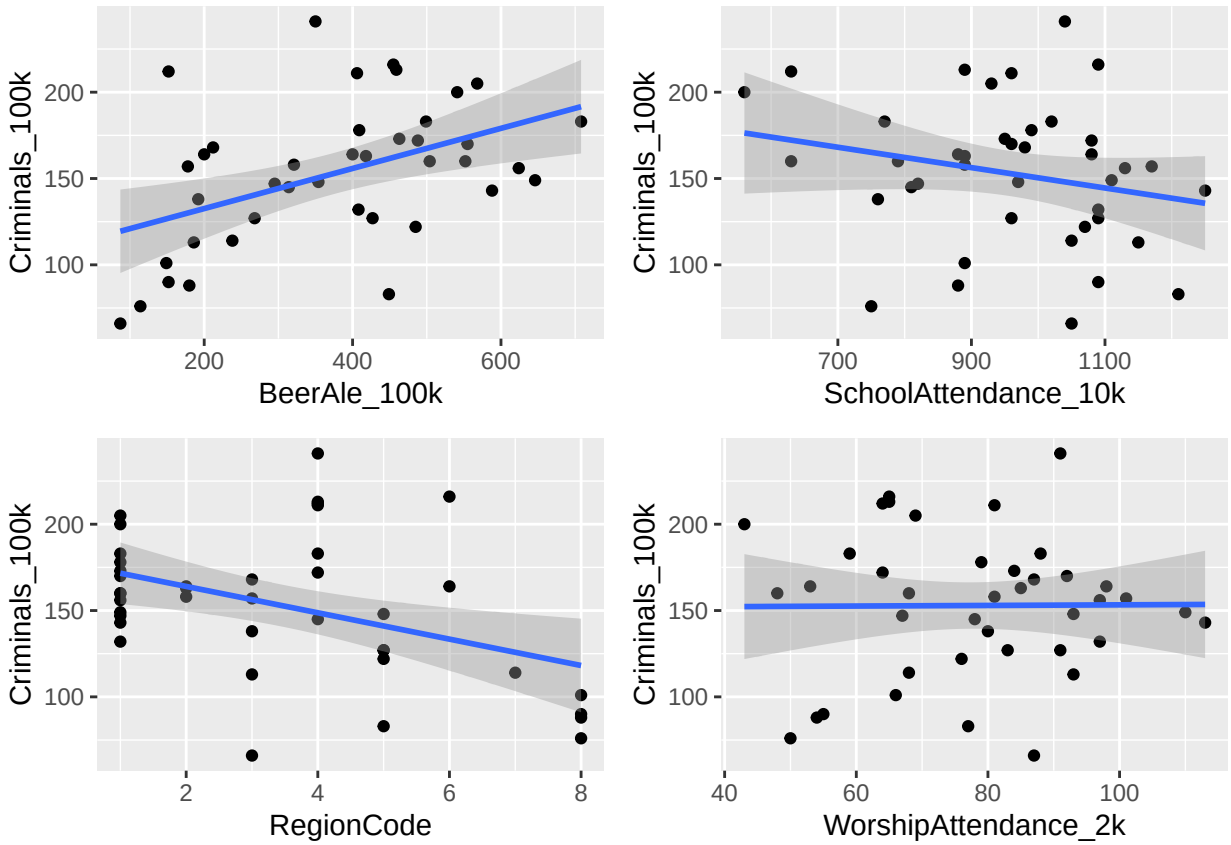

There appears to be a very clear linear dependence of criminal behaviour on bar attendance, with most datapoints falling within the 95% confidence interval of the regression line. There is high variation of criminality across school attendance and worship attendance.