NYPD_Shooting

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About the data

The dataset contains a list of every shooting incident that occurred in New York City (NYC) dating back to 2006 up to the end of the previous calendar year. This data is manually extracted every quarter and reviewed by the Office of Management Analysis and Planning before being posted on the NYPD website. Each record in the dataset represents a shooting incident in NYC and includes information about the event, such as the location and time of occurrence. Additionally, demographic information related to suspects and victims is also included. The dataset is intended for public use to explore the nature of shooting and criminal activity in NYC. For additional information about the dataset, please refer to the attached data footnotes

Import libraries

```
library(tidyverse)
library(lubridate)
```

Import data

```
data <- read_csv("NYPD_Shooting_Incident_Data__Historic_ (2).csv")
head(data)
```

```
## # A tibble: 6 x 21
##   INCIDENT_KEY OCCUR_DATE OCCUR_TIME BORO     LOC_OF_OCCUR_DESC PRECINCT
##          <dbl> <chr>      <time>     <chr>    <chr>                <dbl>
## 1    228798151 05/27/2021 21:30      QUEENS   <NA>                   105
## 2    137471050 06/27/2014 17:40      BRONX    <NA>                    40
## 3    147998800 11/21/2015 03:56      QUEENS   <NA>                   108
## 4    146837977 10/09/2015 18:30      BRONX    <NA>                    44
## 5     58921844 02/19/2009 22:58      BRONX    <NA>                    47
## 6    219559682 10/21/2020 21:36      BROOKLYN <NA>                    81
## # i 15 more variables: JURISDICTION_CODE <dbl>, LOC_CLASSFCTN_DESC <chr>,
## #   LOCATION_DESC <chr>, STATISTICAL_MURDER_FLAG <lgl>, PERP_AGE_GROUP <chr>,
## #   PERP_SEX <chr>, PERP_RACE <chr>, VIC_AGE_GROUP <chr>, VIC_SEX <chr>,
## #   VIC_RACE <chr>, X_COORD_CD <dbl>, Y_COORD_CD <dbl>, Latitude <dbl>,
## #   Longitude <dbl>, Lon_Lat <chr>
```

Cleaning data

Now, we are going to use specific data

```
data_s <- data %>% select(c(INCIDENT_KEY, OCCUR_DATE, BORO, STATISTICAL_MURDER_FLAG, VIC_AGE_GROUP, VIC
data_s$OCCUR_DATE <- as.Date(data_s$OCCUR_DATE, format = "%m/%d/%Y")
summary(data_s)
```

```
##   INCIDENT_KEY         OCCUR_DATE             BORO
##  Min.   :  9953245   Min.   :2006-01-01   Length:27312
##  1st Qu.: 63860880   1st Qu.:2009-07-18   Class :character
##  Median : 90372218   Median :2013-04-29   Mode  :character
##  Mean   :120860536   Mean   :2014-01-06
##  3rd Qu.:188810230   3rd Qu.:2018-10-15
##  Max.   :261190187   Max.   :2022-12-31
##  STATISTICAL_MURDER_FLAG VIC_AGE_GROUP        VIC_SEX
##  Mode :logical           Length:27312       Length:27312
##  FALSE:22046             Class :character   Class :character
##  TRUE :5266              Mode  :character   Mode  :character
##
##
##
```

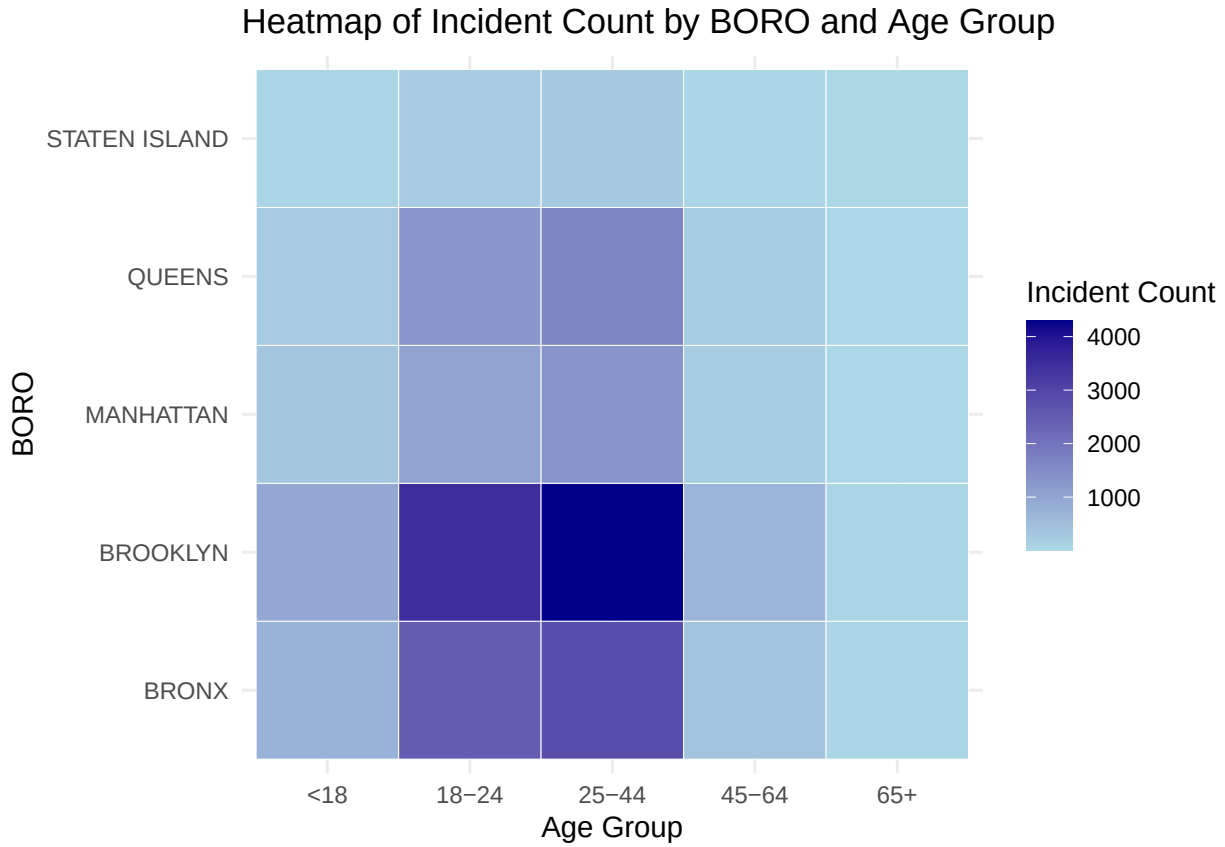
Events by region

```
data_s <- data_s %>%
  group_by(OCCUR_DATE, BORO, STATISTICAL_MURDER_FLAG, VIC_AGE_GROUP, VIC_SEX) %>%
  summarise(count = n_distinct(as.character(INCIDENT_KEY)))
```

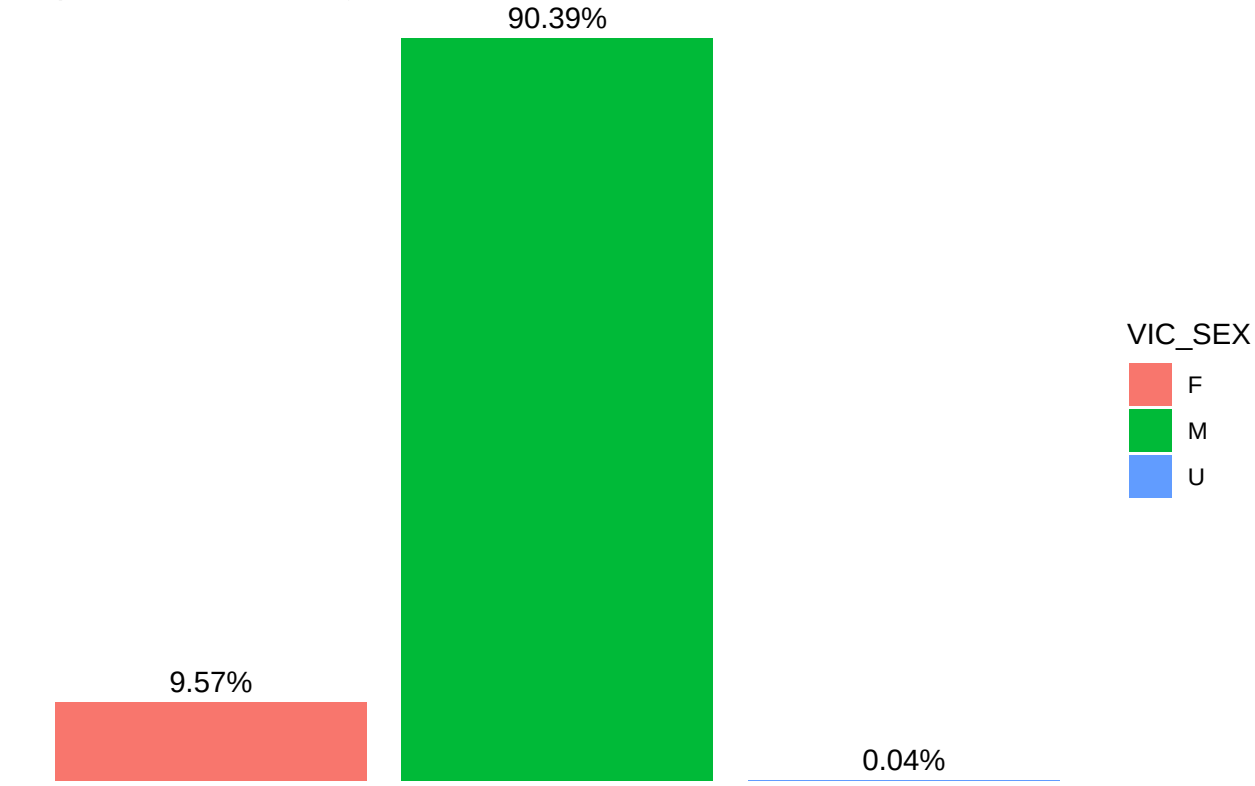
Visual analysis

In general, a higher number of events is observed in the age group of 25 to 44 years old, with Brooklyn and Bronx being the places with the highest frequency. It can be noted that there are values that do not have a correct age label, so they were removed from the analyzed dataset.

```
heatmap_data <- data %>%
  filter(VIC_AGE_GROUP != 'UNKNOWN' & VIC_AGE_GROUP != '1022') %>%
  group_by(BORO, VIC_AGE_GROUP) %>%
  summarise(incident_count = n_distinct(INCIDENT_KEY))


ggplot(heatmap_data, aes(x = VIC_AGE_GROUP, y = BORO, fill = incident_count)) +
  geom_tile(color = "white") +
  scale_fill_gradient(low = "lightblue", high = "darkblue", name = "Incident Count") +
  labs(x = "Age Group", y = "BORO", title = "Heatmap of Incident Count by BORO and Age Group") +
  theme_minimal()
```



Events by sex Now we will examine the events at a general level, separated by gender. A higher number of cases is observed in males, more than 90%.

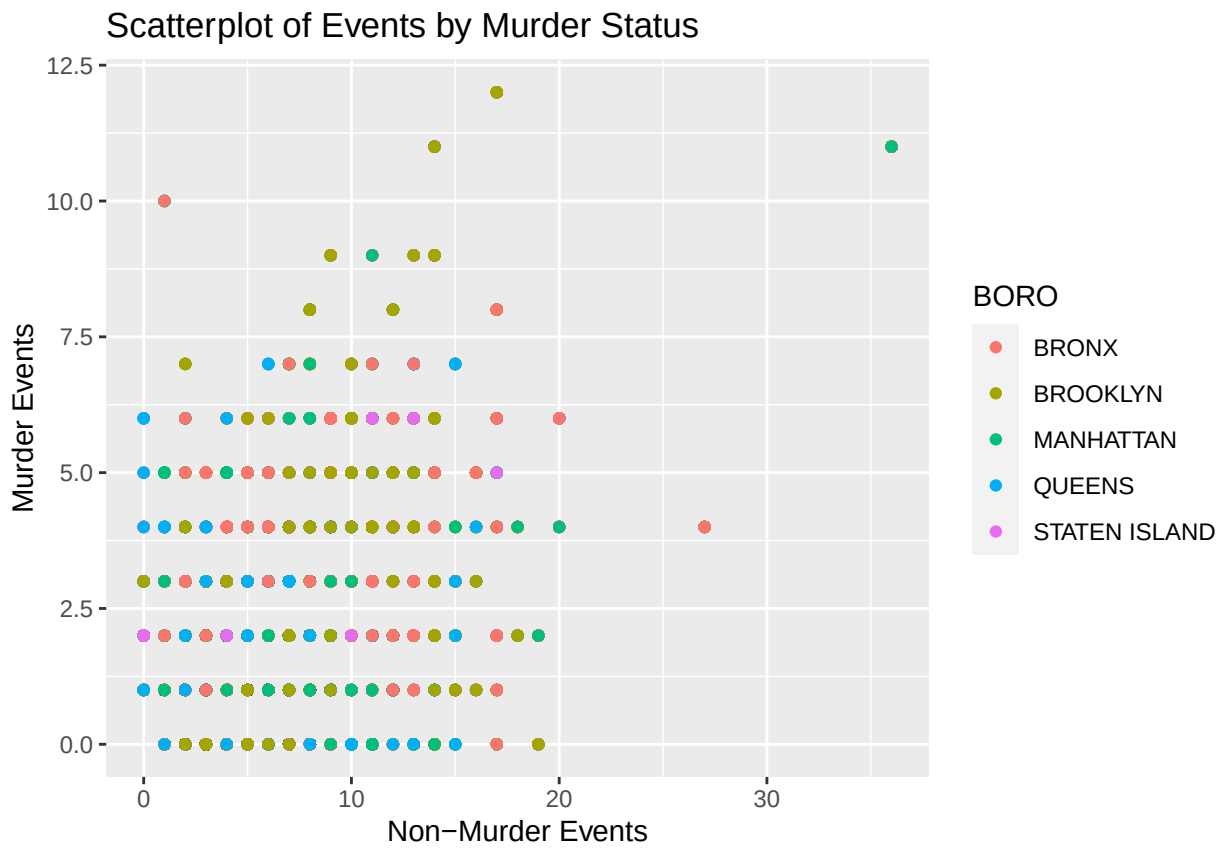


Relationship No Murder Events vs Murder events

And finally, we want to see the relationship between the number of events involving murder and those that do not

Separate by BORO

Let's add some color to the graph, separate it by BORO to have a better perspective.




```
## List of 97
##  $ line                        :List of 6
##   ..$ colour       : chr "black"
##   ..$ linewidth    : num 0.5
##   ..$ linetype     : num 1
##   ..$ lineend      : chr "butt"
##   ..$ arrow        : logi FALSE
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_line" "element"
##  $ rect                        :List of 5
##   ..$ fill         : chr "white"
##   ..$ colour       : chr "black"
##   ..$ linewidth    : num 0.5
##   ..$ linetype     : num 1
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_rect" "element"
##  $ text                        :List of 11
##   ..$ family       : chr ""
##   ..$ face         : chr "plain"
##   ..$ colour       : chr "black"
##   ..$ size         : num 11
##   ..$ hjust        : num 0.5
##   ..$ vjust        : num 0.5
##   ..$ angle        : num 0
##   ..$ lineheight   : num 0.9
##   ..$ margin       : 'margin' num [1:4] 0points 0points 0points 0points
```

```
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : logi FALSE
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ title                     : NULL
##  $ aspect.ratio              : NULL
##  $ axis.title                : NULL
##  $ axis.title.x              :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : num 1
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 2.75points 0points 0points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.title.x.top          :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : num 0
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 0points 2.75points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.title.x.bottom       : NULL
##  $ axis.title.y              :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : num 1
##   ..$ angle        : num 90
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 2.75points 0points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.title.y.left         : NULL
##  $ axis.title.y.right        :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
```

```
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : num 0
##   ..$ angle        : num -90
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.75points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text                :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : chr "grey30"
##   ..$ size         : 'rel' num 0.8
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text.x              :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : num 1
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 2.2points 0points 0points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text.x.top          :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : num 0
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 0points 2.2points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text.x.bottom       : NULL
##  $ axis.text.y              :List of 11
```

```
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : num 1
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 2.2points 0points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text.y.left          : NULL
##  $ axis.text.y.right         :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : num 0
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.2points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.ticks                : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ axis.ticks.x              : NULL
##  $ axis.ticks.x.top          : NULL
##  $ axis.ticks.x.bottom       : NULL
##  $ axis.ticks.y              : NULL
##  $ axis.ticks.y.left         : NULL
##  $ axis.ticks.y.right        : NULL
##  $ axis.ticks.length         : 'simpleUnit' num 2.75points
##   ..- attr(*, "unit")= int 8
##  $ axis.ticks.length.x       : NULL
##  $ axis.ticks.length.x.top   : NULL
##  $ axis.ticks.length.x.bottom: NULL
##  $ axis.ticks.length.y       : NULL
##  $ axis.ticks.length.y.left  : NULL
##  $ axis.ticks.length.y.right : NULL
##  $ axis.line                 : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ axis.line.x               : NULL
##  $ axis.line.x.top           : NULL
##  $ axis.line.x.bottom        : NULL
##  $ axis.line.y               : NULL
##  $ axis.line.y.left          : NULL
##  $ axis.line.y.right         : NULL
##  $ legend.background         : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
```

```
##  $ legend.margin            : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
##   ..- attr(*, "unit")= int 8
##  $ legend.spacing           : 'simpleUnit' num 11points
##   ..- attr(*, "unit")= int 8
##  $ legend.spacing.x         : NULL
##  $ legend.spacing.y         : NULL
##  $ legend.key               : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ legend.key.size          : 'simpleUnit' num 1.2lines
##   ..- attr(*, "unit")= int 3
##  $ legend.key.height        : NULL
##  $ legend.key.width         : NULL
##  $ legend.text              :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : 'rel' num 0.8
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ legend.text.align        : NULL
##  $ legend.title             :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : num 0
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ legend.title.align       : NULL
##  $ legend.position          : chr "right"
##  $ legend.direction         : NULL
##  $ legend.justification     : chr "center"
##  $ legend.box               : NULL
##  $ legend.box.just          : NULL
##  $ legend.box.margin        : 'margin' num [1:4] 0cm 0cm 0cm 0cm
##   ..- attr(*, "unit")= int 1
##  $ legend.box.background    : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ legend.box.spacing       : 'simpleUnit' num 11points
##   ..- attr(*, "unit")= int 8
##  $ panel.background         : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ panel.border             : list()
```

```
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ panel.spacing             : 'simpleUnit' num 5.5points
##   ..- attr(*, "unit")= int 8
##  $ panel.spacing.x           : NULL
##  $ panel.spacing.y           : NULL
##  $ panel.grid                :List of 6
##   ..$ colour       : chr "grey92"
##   ..$ linewidth    : NULL
##   ..$ linetype     : NULL
##   ..$ lineend      : NULL
##   ..$ arrow        : logi FALSE
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_line" "element"
##  $ panel.grid.major          : NULL
##  $ panel.grid.minor          :List of 6
##   ..$ colour       : NULL
##   ..$ linewidth    : 'rel' num 0.5
##   ..$ linetype     : NULL
##   ..$ lineend      : NULL
##   ..$ arrow        : logi FALSE
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_line" "element"
##  $ panel.grid.major.x        : NULL
##  $ panel.grid.major.y        : NULL
##  $ panel.grid.minor.x        : NULL
##  $ panel.grid.minor.y        : NULL
##  $ panel.ontop               : logi FALSE
##  $ plot.background           : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ plot.title                :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : 'rel' num 1.2
##   ..$ hjust        : num 0
##   ..$ vjust        : num 1
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 0points 5.5points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ plot.title.position       : chr "panel"
##  $ plot.subtitle             :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : num 0
##   ..$ vjust        : num 1
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 0points 5.5points 0points
```

```
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ plot.caption              :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : 'rel' num 0.8
##   ..$ hjust        : num 1
##   ..$ vjust        : num 1
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 5.5points 0points 0points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ plot.caption.position     : chr "panel"
##  $ plot.tag                  :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : 'rel' num 1.2
##   ..$ hjust        : num 0.5
##   ..$ vjust        : num 0.5
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ plot.tag.position         : chr "topleft"
##  $ plot.margin               : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
##   ..- attr(*, "unit")= int 8
##  $ strip.background          : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ strip.background.x        : NULL
##  $ strip.background.y        : NULL
##  $ strip.clip                : chr "inherit"
##  $ strip.placement           : chr "inside"
##  $ strip.text                :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : chr "grey10"
##   ..$ size         : 'rel' num 0.8
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 4.4points 4.4points 4.4points 4.4points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
```

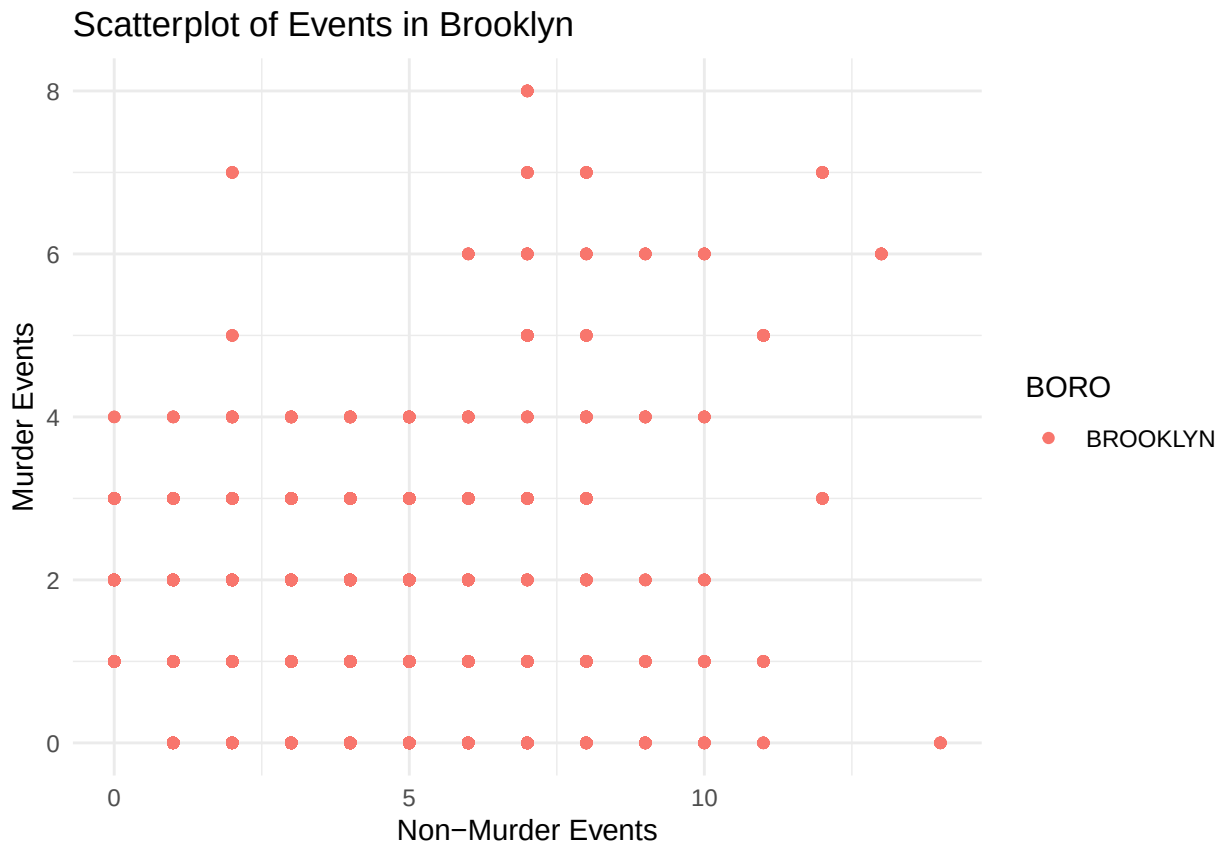
```
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ strip.text.x              : NULL
##  $ strip.text.x.bottom       : NULL
##  $ strip.text.x.top          : NULL
##  $ strip.text.y              :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : num -90
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ strip.text.y.left         :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : num 90
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ strip.text.y.right        : NULL
##  $ strip.switch.pad.grid     : 'simpleUnit' num 2.75points
##   ..- attr(*, "unit")= int 8
##  $ strip.switch.pad.wrap     : 'simpleUnit' num 2.75points
##   ..- attr(*, "unit")= int 8
##  - attr(*, "class")= chr [1:2] "theme" "gg"
##  - attr(*, "complete")= logi TRUE
##  - attr(*, "validate")= logi TRUE
```

Focus on one BORO

The previous analysis allows us to identify that only some places are prone to have a higher number of events and murders. In this code, we will specifically focus on Brooklyn, which, as we saw, concentrates the highest number of cases in males.In this graph, we will see the relationship between the events that do not include a death versus the events that include a death or murder.

```
brooklyn_25_44 <- data %>%
  filter(BORO == "BROOKLYN")

non_murder_events <- brooklyn_25_44 %>%
  filter(STATISTICAL_MURDER_FLAG == FALSE) %>%
  group_by(OCCUR_DATE) %>%
  summarise(non_murder_count = n())
```

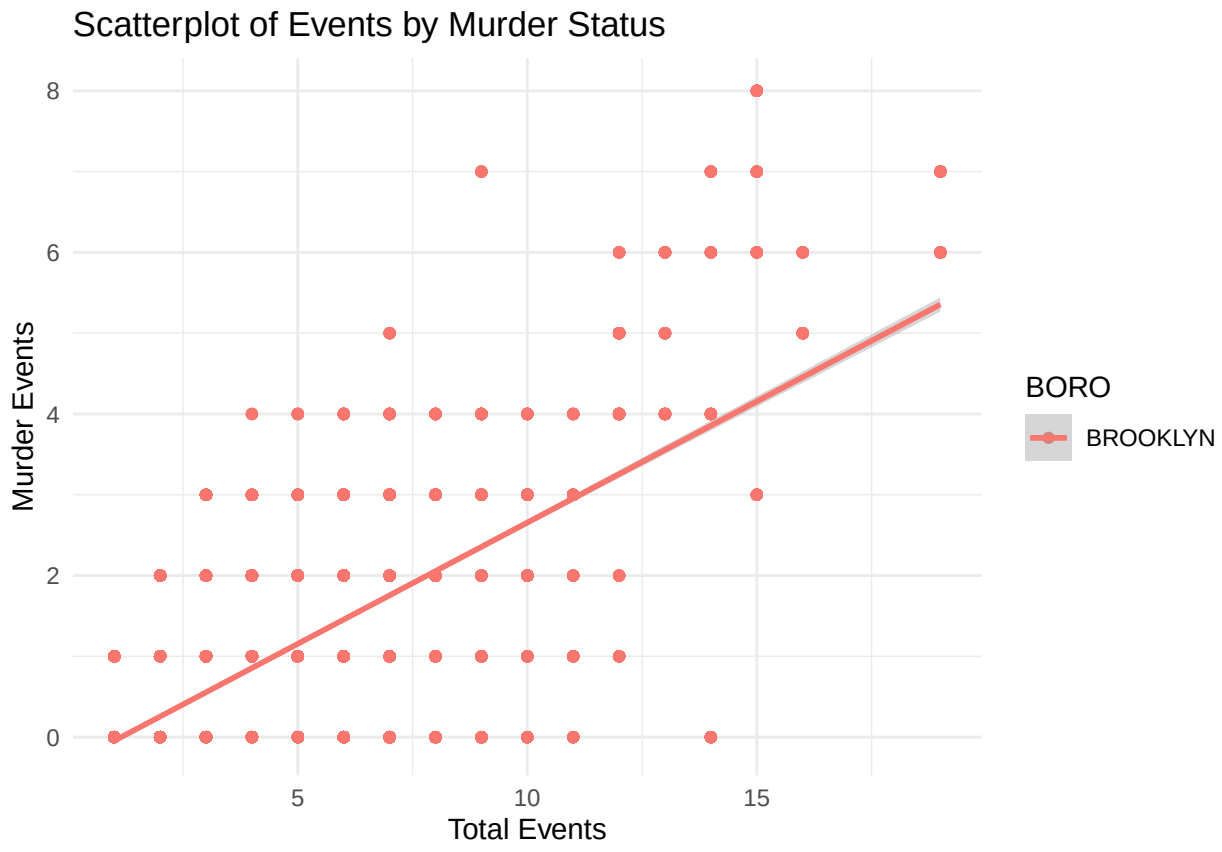
```r
murder_events <- brooklyn_25_44 %>%
  filter(STATISTICAL_MURDER_FLAG == TRUE) %>%
  group_by(OCCUR_DATE) %>%
  summarise(murder_count = n())

combined_data <- full_join(non_murder_events, murder_events, by = "OCCUR_DATE")


combined_data[is.na(combined_data)] <- 0

combined_data <- merge(combined_data, brooklyn_25_44[, c("OCCUR_DATE", "BORO")], by = "OCCUR_DATE", all


ggplot(combined_data, aes(x = non_murder_count, y = murder_count, color = BORO)) +
  geom_point() +
  labs(x = "Non-Murder Events", y = "Murder Events", title = "Scatterplot of Events in Brooklyn") +
  theme_minimal()
```



Relationship between total number of events vs murders

Now let's be more specific. Let's examine the relationship between the total number of events and the number of murders. This will allow us to identify a pattern in the data, after which we can make a prediction with a linear model.

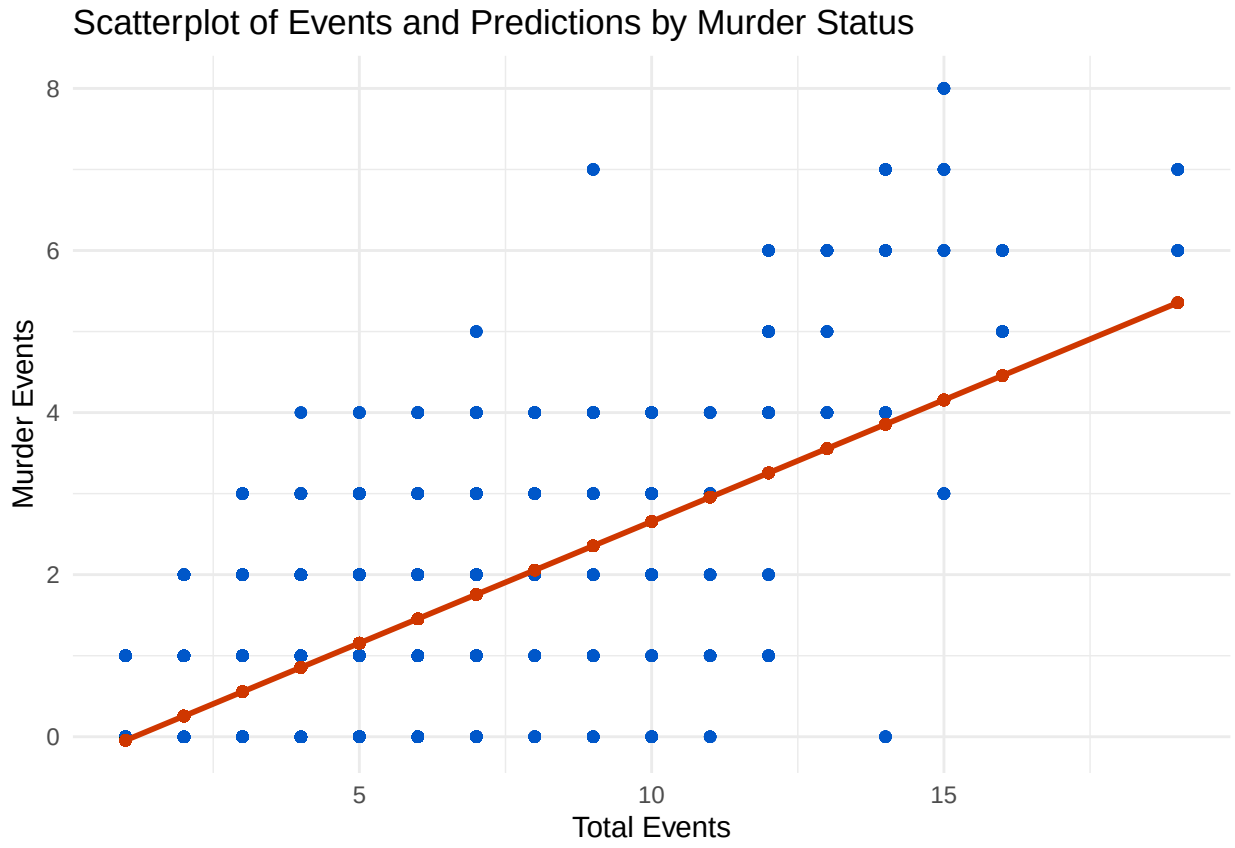
```r
brooklyn <- data %>%
  filter(BORO == "BROOKLYN")


total_events <- brooklyn %>%
  group_by(OCCUR_DATE) %>%
  summarise(total_count = n())


murder_events <- brooklyn %>%
  filter(STATISTICAL_MURDER_FLAG == TRUE) %>%
  group_by(OCCUR_DATE) %>%
  summarise(murder_count = n())

combined_data <- full_join(total_events, murder_events, by = "OCCUR_DATE")

combined_data[is.na(combined_data)] <- 0

combined_data <- merge(combined_data, brooklyn_25_44[, c("OCCUR_DATE", "BORO")], by = "OCCUR_DATE", all


ggplot(combined_data, aes(x = total_count, y = murder_count, color = BORO)) +
  geom_point() +
  labs(x = "Total Events", y = "Murder Events", title = "Scatterplot of Events by Murder Status") +
  theme_minimal()+geom_smooth(method = lm)
```



Linear model

Now, we can plot the linear model.

```
combined_data[is.na(combined_data)] <- 0

model <- lm(murder_count ~ total_count, data = combined_data)

combined_data_pred <- combined_data %>%  mutate(pred = predict(model))


ggplot(combined_data_pred) +
  geom_point(aes(x = total_count, y = murder_count), color = "#0057c9") +
  geom_point(aes(x = total_count, y = pred), color = "#cf3700") +
  geom_smooth(method = "lm", se = FALSE, aes(y = pred, x= total_count), color = "#cf3700") +  # Agregar
  labs(x = "Total Events", y = "Murder Events", title = "Scatterplot of Events and Predictions by Murde
  theme_minimal()
```



Finally, this is the final model and its parameters

The linear regression model that was fitted to the data suggests that there is a statistically significant relationship between the total count of events and the count of murders. The estimated regression equation is:

$$\text{Murder Count} = -0.344916 + 0.300033 \times \text{Total Count}$$

This implies that for each additional event, the murder count is expected to increase by approximately 0.300033, holding all other variables constant. The model has a high statistical significance, with a very low p-value (< 2.2e-16), indicating that the relationship between the total count and murder count is not due to random chance. The R^2 value of 0.4834 suggests that approximately 48.34% of the variability in murder count can be explained by the total count of events, indicating a moderate level of explanatory power.

```
summary(model)
```

```
##
## Call:
## lm(formula = murder_count ~ total_count, data = combined_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.8555 -0.5552  0.0449  0.5444  4.6446
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.344916   0.015101  -22.84   <2e-16 ***
## total_count  0.300033   0.002967  101.13   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9334 on 10931 degrees of freedom
## Multiple R-squared:  0.4834, Adjusted R-squared:  0.4833
## F-statistic: 1.023e+04 on 1 and 10931 DF,  p-value: < 2.2e-16
```

Considerations and BIAS

In the analysis of shooting incidents, it is crucial to consider various biases that could influence the results. One of the most evident biases could be the underreporting of incidents, where some events might not be reported, leading to an underestimation of the true magnitude of the problem. Additionally, data availability could be biased towards certain geographical areas or demographic groups, which could distort the full picture of gun violence in a particular region. It is also important to consider any bias in data collection and classification, as well as possible implicit biases in the analysis itself, which could influence the conclusions drawn. Recognizing and addressing these biases is essential to obtain a more comprehensive and accurate understanding of the situation of shootings and their social implications.

As for the analysis, some considerations include excluding data that does not make sense or are outliers, and categorizing null records.