Exploratory Data Analysis, Assignment 1

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/* Whole document: */ body{ font-family: Helvetica; font-size: 12pt; } /* Headers */ h1,h2,h3,h4,h5,h6{ font-size: 14pt; }

This is the exploratory data analysis of NYC crime complaints. The first step in any Exploratory Analysis is to ask questions. Then find the patterns and trends with the help of graphical and statistical methods in the data to make informed decisions and to answer the question. This includes finding how many records there are total, looking at the anomalies of the data, and looking for what information could be interesting for further analysis.

We'll address the following questions as we go ahead in this EDA:

1. Summary of the dataset

2. How much crime does each borough have?

3. Which borough has the highest number of crimes?

4. Visualisation of crimes each month and categorised by borough

5. Complaints per borough as a pie chart

6. What are the different crime categories (level of offense)

7. Which departments are solving crimes by month?

8. How many of each of the crimes have taken place?

9. How many victims are present in each age group?

10. Which age group is most likely to be a victim?

11. How many crimes are happening between 12am - 6am

12. How many Murders take place in this time frame?

13. How many Murders happening between 12 am to 6am per age group

14. Distribution of the co-ordinates of the above crimes

15. How many street crimes occur by borough?

16. What are the races of victims of street crimes?

EXPLORARTORY DATA ANALYSIS OF NYC CRIME COMPLAINTS:

1. Summary of the dataset:

1.1 Loading all the required libraries

```
library(ggplot2)
library(dplyr)
library(tidyverse)
library(lubridate)
library(plotly)
library(gridExtra)
```

1.2 Read the data into dataframe

```
data <- read.csv("NYC_complaints.csv")
head(data)
```

```
##   CMPLNT_NUM ADDR_PCT_CD BORO_NM CMPLNT_FR_DT CMPLNT_FR_TM CMPLNT_TO_DT
## 1  903695881          69           12/17/2021     22:13:00
## 2  400462399         113           12/17/2021      6:21:00
## 3  587910690         113           12/13/2021     20:05:00
## 4  186105368          52   BRONX    12/7/2021     22:49:00
## 5  185325394         113            12/6/2021     17:25:00
## 6  791525475          44            12/5/2021     22:16:00
##   CMPLNT_TO_TM CRM_ATPT_CPTD_CD HADEVELOPT HOUSING_PSA JURISDICTION_CODE
## 1                    COMPLETED                    NA                NA
## 2                    COMPLETED                    NA                NA
## 3                    COMPLETED                    NA                NA
## 4                    COMPLETED                    NA                 0
## 5                    COMPLETED                    NA                NA
## 6                    COMPLETED                    NA                NA
##         JURIS_DESC KY_CD LAW_CAT_CD LOC_OF_OCCUR_DESC
## 1 N.Y. POLICE DEPT   101     FELONY           OUTSIDE
## 2 N.Y. POLICE DEPT   101     FELONY           OUTSIDE
## 3 N.Y. POLICE DEPT   101     FELONY           OUTSIDE
## 4 N.Y. POLICE DEPT   118     FELONY
## 5 N.Y. POLICE DEPT   101     FELONY            INSIDE
## 6 N.Y. POLICE DEPT   101     FELONY           OUTSIDE
##                          OFNS_DESC PARKS_NM       PATROL_BORO PD_CD
## 1 MURDER & NON-NEGL. MANSLAUGHTER                              NA
## 2 MURDER & NON-NEGL. MANSLAUGHTER                              NA
## 3 MURDER & NON-NEGL. MANSLAUGHTER                              NA
## 4               DANGEROUS WEAPONS          PATROL BORO BRONX   792
## 5 MURDER & NON-NEGL. MANSLAUGHTER                              NA
## 6 MURDER & NON-NEGL. MANSLAUGHTER                              NA
```

```
##                   PD_DESC PREM_TYP_DESC     RPT_DT STATION_NAME SUSP_AGE_GROUP
## 1                                       12/17/2021                        25-44
## 2                                       12/17/2021
## 3                                       12/13/2021
## 4 WEAPONS POSSESSION 1 & 2        STREET  12/7/2021
## 5                                        12/6/2021                        25-44
## 6                                        12/5/2021
##   SUSP_RACE SUSP_SEX TRANSIT_DISTRICT VIC_AGE_GROUP       VIC_RACE VIC_SEX
## 1     BLACK        M                NA         25-44          BLACK       M
## 2                                   NA         25-44          BLACK       F
## 3                                   NA         25-44          BLACK       M
## 4                                   NA       UNKNOWN        UNKNOWN       E
## 5     BLACK        M                NA         25-44          BLACK       M
## 6                                   NA         18-24 BLACK HISPANIC       M
##   X_COORD_CD Y_COORD_CD Latitude Longitude
## 1    1011203     174515 40.64565 -73.90288
## 2    1043252     187998 40.68250 -73.78727
## 3    1042087     190443 40.68922 -73.79145
## 4    1017088     260895 40.88272 -73.88125
## 5    1046176     193100 40.69648 -73.77668
## 6    1007687     246038 40.84197 -73.91530
##                                  Lat_Lon
## 1  (40.64564719600002, -73.90287588699994)
## 2 (40.682499421000045, -73.78726915499993)
## 3 (40.689218058000044, -73.79144856999993)
## 4  (40.88271780700006, -73.88124724999993)
## 5  (40.69648322200004, -73.77667979199998)
## 6  (40.84196981100007, -73.91529662699998)
##                       New.Georeferenced.Column
## 1  POINT (-73.90287588699994 40.64564719600002)
## 2 POINT (-73.78726915499993 40.682499421000045)
## 3 POINT (-73.79144856999993 40.689218058000044)
## 4  POINT (-73.88124724999993 40.88271780700006)
## 5  POINT (-73.77667979199998 40.69648322200004)
## 6  POINT (-73.91529662699998 40.84196981100007)
```

The data includes diverse datatypes - this analysis includes date-times, multi-layered factors, and even latitude/longitude point data

1.3 Printing dimension of the dataset

```
glimpse(data)
```

```
## Rows: 449,506
## Columns: 36
## $ CMPLNT_NUM              <int> 903695881, 400462399, 587910690, 186105368, 1~
## $ ADDR_PCT_CD             <int> 69, 113, 113, 52, 113, 44, 47, 46, 75, 73, 10~
## $ BORO_NM                 <chr> "", "", "", "BRONX", "", "", "BRONX", "", "",~
## $ CMPLNT_FR_DT            <chr> "12/17/2021", "12/17/2021", "12/13/2021", "12~
## $ CMPLNT_FR_TM            <chr> "22:13:00", "6:21:00", "20:05:00", "22:49:00"~
```

```
## $ CMPLNT_TO_DT             <chr> "", "", "", "", "", "", "", "", "", "", "", "~
## $ CMPLNT_TO_TM             <chr> "", "", "", "", "", "", "", "", "", "", "", "~
## $ CRM_ATPT_CPTD_CD         <chr> "COMPLETED", "COMPLETED", "COMPLETED", "COMPL~
## $ HADEVELOPT               <chr> "", "", "", "", "", "", "", "", "", "", "", "~
## $ HOUSING_PSA              <int> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, N~
## $ JURISDICTION_CODE        <int> NA, NA, NA, 0, NA, NA, 0, NA, NA, NA, NA, NA,~
## $ JURIS_DESC               <chr> "N.Y. POLICE DEPT", "N.Y. POLICE DEPT", "N.Y.~
## $ KY_CD                    <int> 101, 101, 101, 118, 101, 101, 118, 101, 101, ~
## $ LAW_CAT_CD               <chr> "FELONY", "FELONY", "FELONY", "FELONY", "FELO~
## $ LOC_OF_OCCUR_DESC        <chr> "OUTSIDE", "OUTSIDE", "OUTSIDE", "", "INSIDE"~
## $ OFNS_DESC                <chr> "MURDER & NON-NEGL. MANSLAUGHTER", "MURDER & ~
## $ PARKS_NM                 <chr> "", "", "", "", "", "", "", "", "", "", "", "~
## $ PATROL_BORO              <chr> "", "", "", "PATROL BORO BRONX", "", "", "PAT~
## $ PD_CD                    <int> NA, NA, NA, 792, NA, NA, 792, NA, NA, NA, NA,~
## $ PD_DESC                  <chr> "", "", "", "WEAPONS POSSESSION 1 & 2", "", "~
## $ PREM_TYP_DESC            <chr> "", "", "", "STREET", "", "", "STREET", "", "~
## $ RPT_DT                   <chr> "12/17/2021", "12/17/2021", "12/13/2021", "12~
## $ STATION_NAME             <chr> "", "", "", "", "", "", "", "", "", "", "", "~
## $ SUSP_AGE_GROUP           <chr> "25-44", "", "", "", "25-44", "", "", "25-44"~
## $ SUSP_RACE                <chr> "BLACK", "", "", "", "BLACK", "", "", "BLACK"~
## $ SUSP_SEX                 <chr> "M", "", "", "", "M", "", "", "M", "", "M", "~
## $ TRANSIT_DISTRICT         <int> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, N~
## $ VIC_AGE_GROUP            <chr> "25-44", "25-44", "25-44", "UNKNOWN", "25-44"~
## $ VIC_RACE                 <chr> "BLACK", "BLACK", "BLACK", "UNKNOWN", "BLACK"~
## $ VIC_SEX                  <chr> "M", "F", "M", "E", "M", "M", "E", "F", "M", ~
## $ X_COORD_CD               <int> 1011203, 1043252, 1042087, 1017088, 1046176, ~
## $ Y_COORD_CD               <int> 174515, 187998, 190443, 260895, 193100, 24603~
## $ Latitude                 <dbl> 40.64565, 40.68250, 40.68922, 40.88272, 40.69~
## $ Longitude                <dbl> -73.90288, -73.78727, -73.79145, -73.88125, -~
## $ Lat_Lon                  <chr> "(40.64564719600002, -73.90287588699994)", "(~
## $ New.Georeferenced.Column <chr> "POINT (-73.90287588699994 40.64564719600002)~
```

1.4 Dropping columns that are not in immediate use

```
df <- data[ -c(2,6,7,9,10,11,13,15,17,18,19,20,23,27,31,32,36) ]
head(df)
```

```
##   CMPLNT_NUM BORO_NM CMPLNT_FR_DT CMPLNT_FR_TM CRM_ATPT_CPTD_CD
## 1  903695881           12/17/2021     22:13:00        COMPLETED
## 2  400462399           12/17/2021      6:21:00        COMPLETED
## 3  587910690           12/13/2021     20:05:00        COMPLETED
## 4  186105368   BRONX    12/7/2021     22:49:00        COMPLETED
## 5  185325394            12/6/2021     17:25:00        COMPLETED
## 6  791525475            12/5/2021     22:16:00        COMPLETED
##         JURIS_DESC LAW_CAT_CD                       OFNS_DESC PREM_TYP_DESC
## 1 N.Y. POLICE DEPT     FELONY MURDER & NON-NEGL. MANSLAUGHTER
## 2 N.Y. POLICE DEPT     FELONY MURDER & NON-NEGL. MANSLAUGHTER
## 3 N.Y. POLICE DEPT     FELONY MURDER & NON-NEGL. MANSLAUGHTER
## 4 N.Y. POLICE DEPT     FELONY               DANGEROUS WEAPONS        STREET
## 5 N.Y. POLICE DEPT     FELONY MURDER & NON-NEGL. MANSLAUGHTER
## 6 N.Y. POLICE DEPT     FELONY MURDER & NON-NEGL. MANSLAUGHTER
```

```
##       RPT_DT SUSP_AGE_GROUP SUSP_RACE SUSP_SEX VIC_AGE_GROUP       VIC_RACE
## 1 12/17/2021          25-44     BLACK        M         25-44          BLACK
## 2 12/17/2021                                             25-44          BLACK
## 3 12/13/2021                                             25-44          BLACK
## 4  12/7/2021                                          UNKNOWN        UNKNOWN
## 5  12/6/2021          25-44     BLACK        M         25-44          BLACK
## 6  12/5/2021                                             18-24 BLACK HISPANIC
##   VIC_SEX Latitude Longitude                                Lat_Lon
## 1       M 40.64565 -73.90288  (40.64564719600002, -73.90287588699994)
## 2       F 40.68250 -73.78727 (40.682499421000045, -73.78726915499993)
## 3       M 40.68922 -73.79145 (40.689218058000044, -73.79144856999993)
## 4       E 40.88272 -73.88125  (40.88271780700006, -73.88124724999993)
## 5       M 40.69648 -73.77668  (40.69648322200004, -73.77667979199998)
## 6       M 40.84197 -73.91530  (40.84196981100007, -73.91529662699998)
```

1.5 Renaming the columns for better understanding and analysis

```
names(df) <- c("ID","Borough","Date","Time","Crime Status","Jurisdiction","Level of offense", "Offense"
head(df)
```

```
##          ID Borough       Date     Time Crime Status     Jurisdiction
## 1 903695881         12/17/2021 22:13:00    COMPLETED N.Y. POLICE DEPT
## 2 400462399         12/17/2021  6:21:00    COMPLETED N.Y. POLICE DEPT
## 3 587910690         12/13/2021 20:05:00    COMPLETED N.Y. POLICE DEPT
## 4 186105368   BRONX  12/7/2021 22:49:00    COMPLETED N.Y. POLICE DEPT
## 5 185325394          12/6/2021 17:25:00    COMPLETED N.Y. POLICE DEPT
## 6 791525475          12/5/2021 22:16:00    COMPLETED N.Y. POLICE DEPT
##   Level of offense                          Offense Premise Report Date
## 1           FELONY MURDER & NON-NEGL. MANSLAUGHTER          12/17/2021
## 2           FELONY MURDER & NON-NEGL. MANSLAUGHTER          12/17/2021
## 3           FELONY MURDER & NON-NEGL. MANSLAUGHTER          12/13/2021
## 4           FELONY               DANGEROUS WEAPONS  STREET   12/7/2021
## 5           FELONY MURDER & NON-NEGL. MANSLAUGHTER           12/6/2021
## 6           FELONY MURDER & NON-NEGL. MANSLAUGHTER           12/5/2021
##    Suspect age Suspect race Suspect sex Victim age    Victim race  Victim sex
## 1        25-44        BLACK           M      25-44          BLACK           M
## 2                                               25-44          BLACK           F
## 3                                               25-44          BLACK           M
## 4                                            UNKNOWN        UNKNOWN           E
## 5        25-44        BLACK           M      25-44          BLACK           M
## 6                                               18-24 BLACK HISPANIC           M
##   Latitude Longtitude                                Cordinates
## 1 40.64565  -73.90288  (40.64564719600002, -73.90287588699994)
## 2 40.68250  -73.78727 (40.682499421000045, -73.78726915499993)
## 3 40.68922  -73.79145 (40.689218058000044, -73.79144856999993)
## 4 40.88272  -73.88125  (40.88271780700006, -73.88124724999993)
## 5 40.69648  -73.77668  (40.69648322200004, -73.77667979199998)
## 6 40.84197  -73.91530  (40.84196981100007, -73.91529662699998)
```

1.6 Printing dimensions and details of the new dataset

```
glimpse(df)
```

```
## Rows: 449,506
## Columns: 19
## $ ID                 <int> 903695881, 400462399, 587910690, 186105368, 1853253~
## $ Borough            <chr> "", "", "", "BRONX", "", "", "BRONX", "", "", "", "~
## $ Date               <chr> "12/17/2021", "12/17/2021", "12/13/2021", "12/7/202~
## $ Time               <chr> "22:13:00", "6:21:00", "20:05:00", "22:49:00", "17:~
## $ `Crime Status`     <chr> "COMPLETED", "COMPLETED", "COMPLETED", "COMPLETED",~
## $ Jurisdiction       <chr> "N.Y. POLICE DEPT", "N.Y. POLICE DEPT", "N.Y. POLIC~
## $ `Level of offense` <chr> "FELONY", "FELONY", "FELONY", "FELONY", "FELONY", "~
## $ Offense            <chr> "MURDER & NON-NEGL. MANSLAUGHTER", "MURDER & NON-NE~
## $ Premise            <chr> "", "", "", "STREET", "", "", "STREET", "", "", "",~
## $ `Report Date`      <chr> "12/17/2021", "12/17/2021", "12/13/2021", "12/7/202~
## $ ` Suspect age`     <chr> "25-44", "", "", "", "25-44", "", "", "25-44", "", ~
## $ `Suspect race`     <chr> "BLACK", "", "", "", "BLACK", "", "", "BLACK", "", ~
## $ `Suspect sex`      <chr> "M", "", "", "", "M", "", "", "M", "", "M", "", "",~
## $ `Victim age`       <chr> "25-44", "25-44", "25-44", "UNKNOWN", "25-44", "18-~
## $ ` Victim race`     <chr> "BLACK", "BLACK", "BLACK", "UNKNOWN", "BLACK", "BLA~
## $ ` Victim sex`      <chr> "M", "F", "M", "E", "M", "M", "E", "F", "M", "M", "~
## $ Latitude           <dbl> 40.64565, 40.68250, 40.68922, 40.88272, 40.69648, 4~
## $ Longtitude         <dbl> -73.90288, -73.78727, -73.79145, -73.88125, -73.776~
## $ Cordinates         <chr> "(40.64564719600002, -73.90287588699994)", "(40.682~
```

1.7 Formatting the date to get date month and year separately

```
df$Date <- as.Date(as.character(df$Date), format = "%m/%d/%y")
df$date2 <- df$Date
df <- separate(df, col = date2, into = c("year","month","day"), sep ="-")
```

One of the key aims of an EDA is to identify problems within the data and fix ("clean") them where possible. This can make later analyses more accurate, and provide insight into ways that the data collection process could improve.

1.8 Replacing empty cells with value "NOT REPORTED"

```
df <- df%>%mutate_if(is.character, list(~na_if(.,"")))
df[is.na(df)]<- "NOT REPORTED"
head(df)
```

```
##          ID      Borough       Date     Time Crime Status     Jurisdiction
```

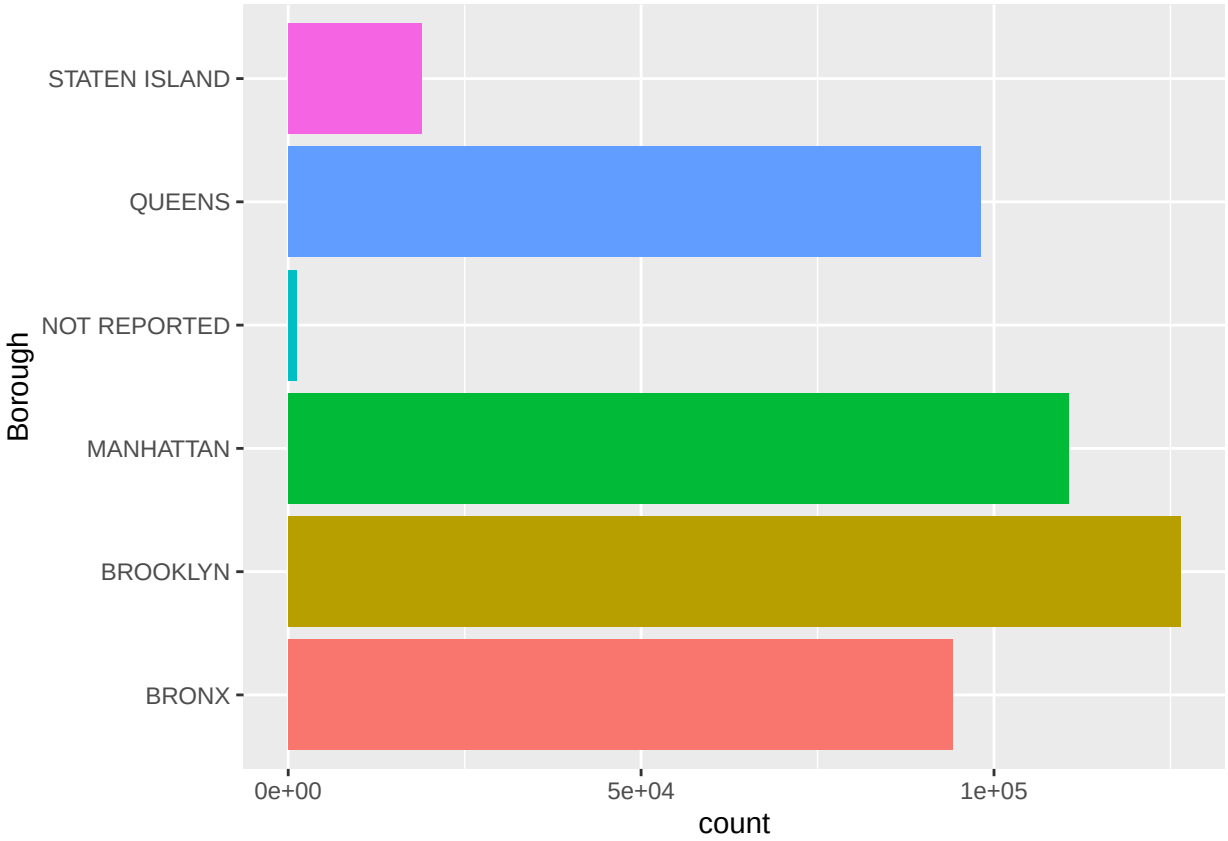
```
## 1 903695881 NOT REPORTED 2020-12-17 22:13:00    COMPLETED N.Y. POLICE DEPT
## 2 400462399 NOT REPORTED 2020-12-17  6:21:00    COMPLETED N.Y. POLICE DEPT
## 3 587910690 NOT REPORTED 2020-12-13 20:05:00    COMPLETED N.Y. POLICE DEPT
## 4 186105368        BRONX 2020-12-07 22:49:00    COMPLETED N.Y. POLICE DEPT
## 5 185325394 NOT REPORTED 2020-12-06 17:25:00    COMPLETED N.Y. POLICE DEPT
## 6 791525475 NOT REPORTED 2020-12-05 22:16:00    COMPLETED N.Y. POLICE DEPT
##   Level of offense                        Offense      Premise Report Date
## 1           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED  12/17/2021
## 2           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED  12/17/2021
## 3           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED  12/13/2021
## 4           FELONY               DANGEROUS WEAPONS       STREET   12/7/2021
## 5           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   12/6/2021
## 6           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   12/5/2021
##    Suspect age Suspect race  Suspect sex Victim age    Victim race  Victim sex
## 1        25-44        BLACK            M      25-44          BLACK           M
## 2 NOT REPORTED NOT REPORTED NOT REPORTED      25-44          BLACK           F
## 3 NOT REPORTED NOT REPORTED NOT REPORTED      25-44          BLACK           M
## 4 NOT REPORTED NOT REPORTED NOT REPORTED    UNKNOWN        UNKNOWN           E
## 5        25-44        BLACK            M      25-44          BLACK           M
## 6 NOT REPORTED NOT REPORTED NOT REPORTED      18-24 BLACK HISPANIC           M
##   Latitude Longtitude                                Cordinates year month day
## 1 40.64565  -73.90288  (40.64564719600002, -73.90287588699994) 2020    12  17
## 2 40.68250  -73.78727 (40.682499421000045, -73.78726915499993) 2020    12  17
## 3 40.68922  -73.79145 (40.689218058000044, -73.79144856999993) 2020    12  13
## 4 40.88272  -73.88125  (40.88271780700006, -73.88124724999993) 2020    12  07
## 5 40.69648  -73.77668  (40.69648322200004, -73.77667979199998) 2020    12  06
## 6 40.84197  -73.91530  (40.84196981100007, -73.91529662699998) 2020    12  05
```

Doing this as no information is known to assign a default value to it. By doing this we can identify inconsistencies in the data and how it affects the analysis.

2. How much crime does each borough have?

2.1 Count of crimes in each borough

```
cf <- ggplot(df, aes(x = Borough, fill=as.factor(Borough))) + geom_bar(width=0.9, stat="count") + theme
print(cf)
```



3. Which borough has the highest number of crimes?

- From the above visualisation, we can say that Brooklyn has the highest crimes among the boroughs and number of "not reported" crimes are less.

4. Visualisation of crimes each month, day and categorised by borough

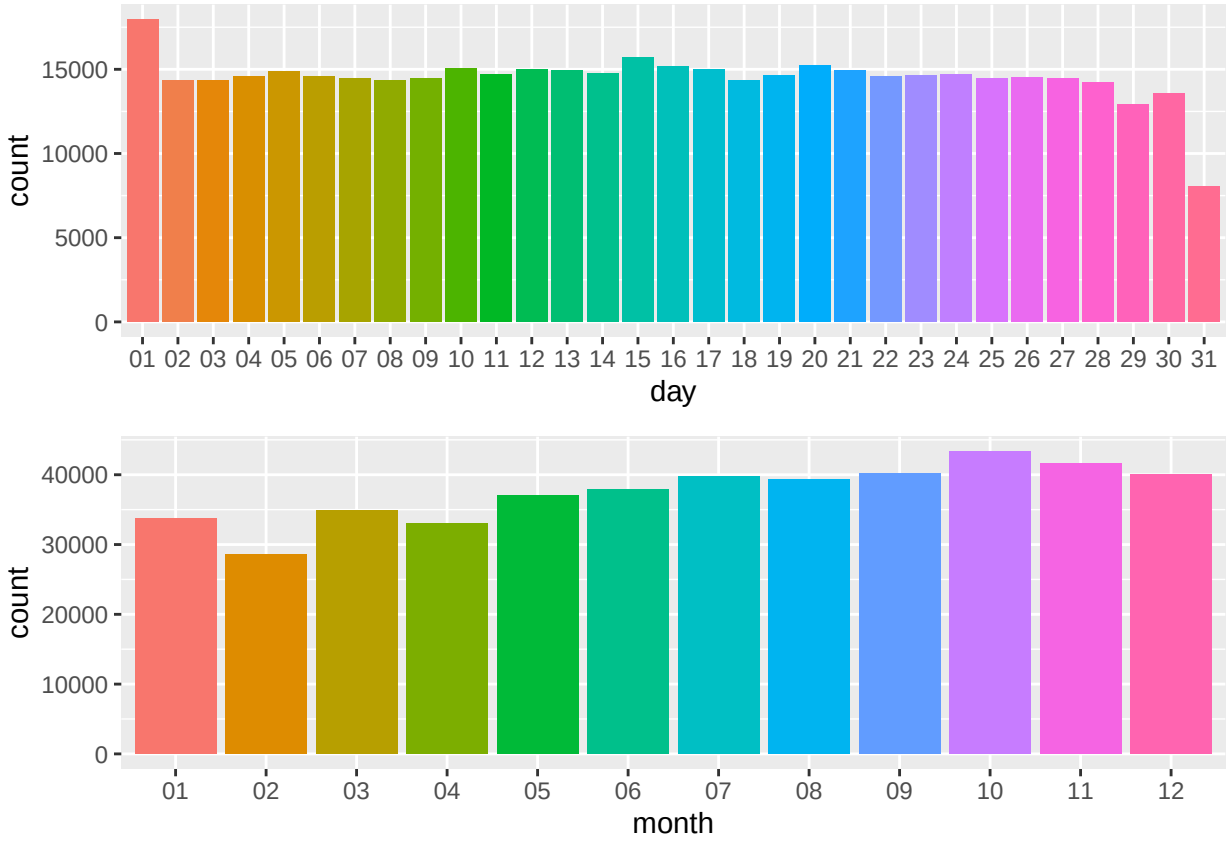
Let's analyze the datetime fields formatted previously. Namely, crime record frequency by: Month of Year.

4.1 Count of crimes per month

```
mf <- ggplot(df, aes(x = month, fill=as.factor(month))) + geom_bar(width=0.9, stat="count") + theme(leg

dff <- ggplot(df, aes(x = day, fill=as.factor(day))) + geom_bar(width=0.9, stat="count") + theme(legend
```

```
grid.arrange(dff, mf)
```



The month of october, followed by november and december had the highest crimes with more than 40000 cases, and February the least with below 30000 complaints recorded.

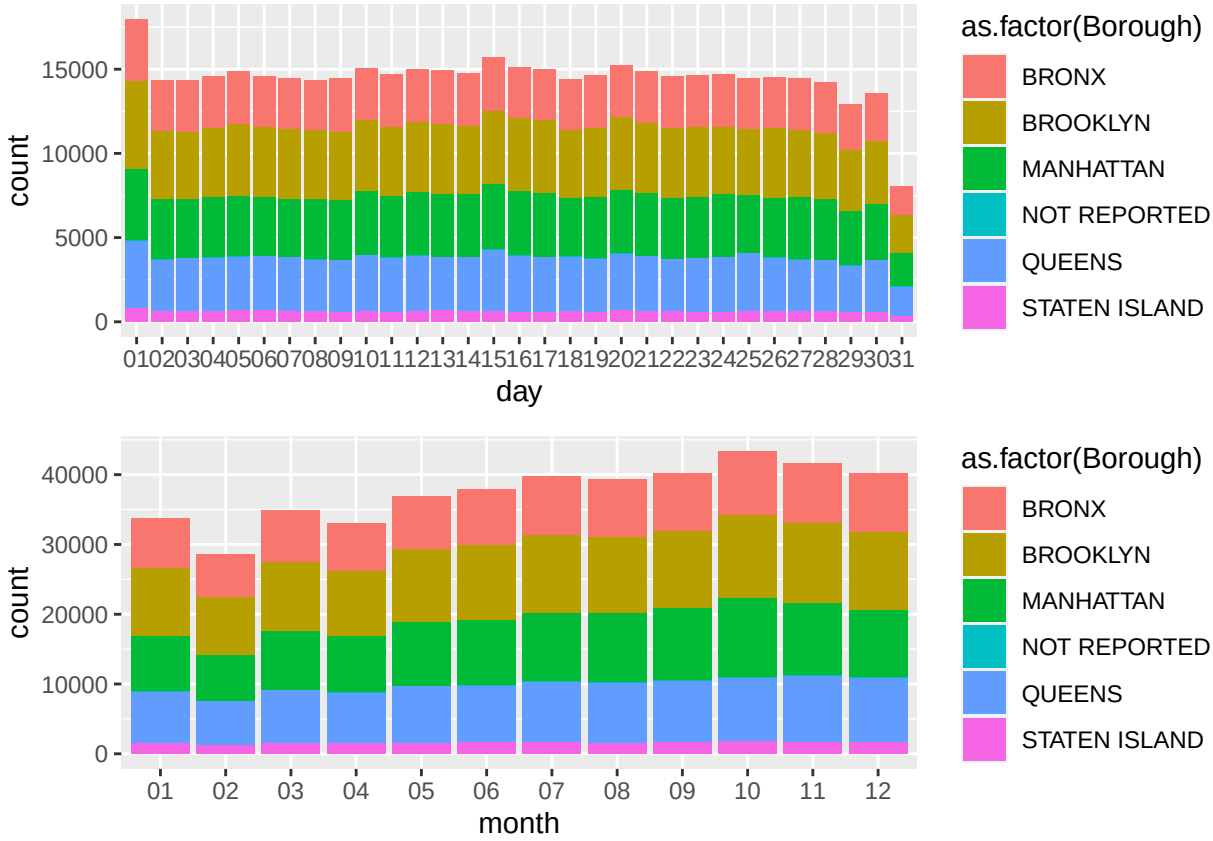
The first of every month has the most number of complaints with approximately 17500 complaints recorded and the last day of every month had the least compaints with nearly 7500 complaints, which is 10000 less than on first day.

4.2 Count of crimes per month and day categorised by borough

```
mb <- ggplot(df, aes(x = month, fill=as.factor(Borough))) + geom_bar(width=0.9, stat="count") + theme(l

db <- ggplot(df, aes(x = day, fill=as.factor(Borough))) + geom_bar(width=0.9, stat="count") + theme(leg

grid.arrange(db, mb)
```

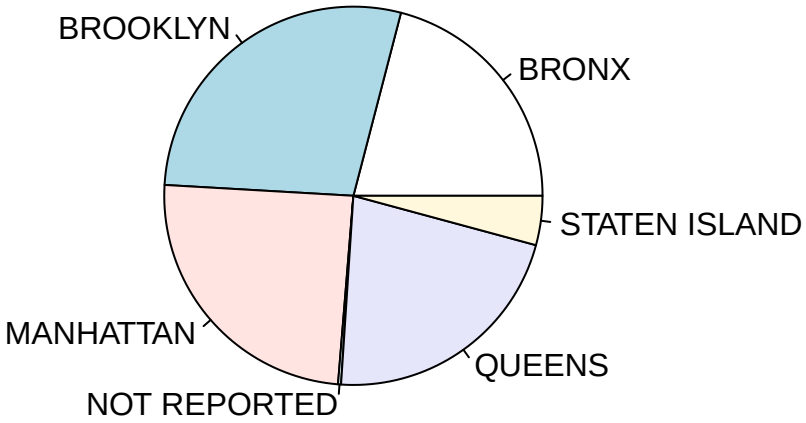


- By observation, Brooklyn has the highest and Staten island has the least portion of crimes in most of the months and days.

- All boroughs seem to have constant number of complaints per month throughout the year.

5. Complaints per borough as a pie chart

```
cnt <-pie(table(df$`Borough`))
```



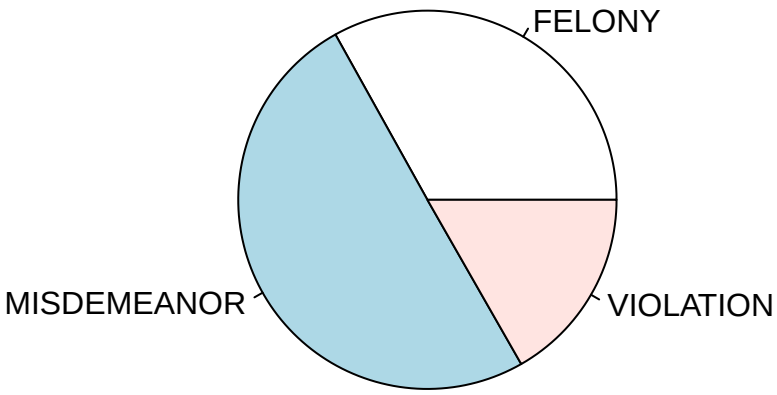
Portion of "Not reported" boroughs is negligible compared to the whole data available.

6. What are the different crime categories (level of offense)

All offenses are split into 3 categories in the order: FELONY, MISDEMEANOR, and VIOLATION.

In terms of crime severity, we can infer by names and the frequencies of these categories: FELONY is the most severe, then MISDEMEANOR and VIOLATION.

```
lc <- pie(table(df$`Level of offense`))
```



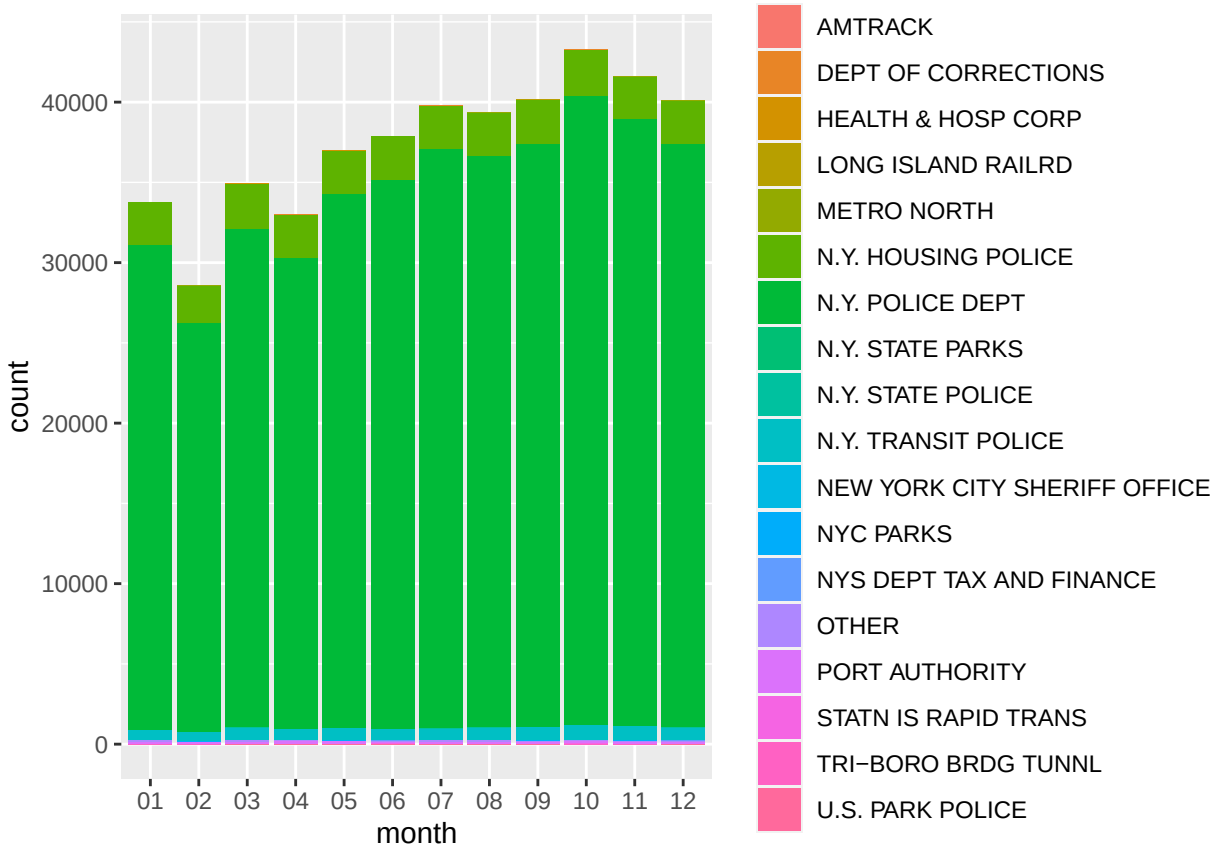
- Misdemeanor is about 50% of offenses, felony and violation are 33% and 27% repectively

7. Which departments are solving crimes by month?

```
pd<-ggplot(data=df,aes(x=`month`,fill=`Jurisdiction`))+geom_histogram(stat="count")+ scale_fill_discrete
```

```
## Warning: Ignoring unknown parameters: binwidth, bins, pad
```

```
print(pd)
```



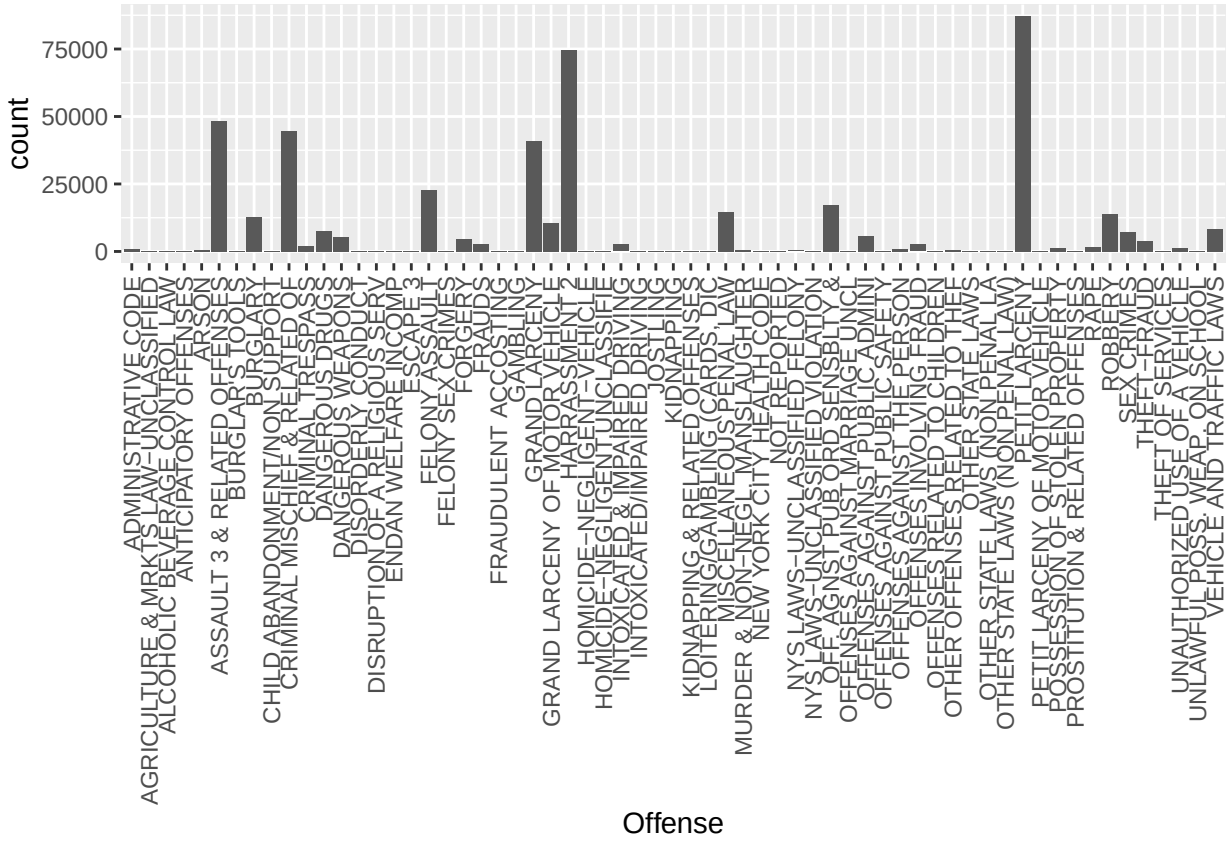
- Most of the crime complaints are taken up by the N.Y. Police Department.

8. How many of each of the crimes have taken place?

```
oc <- ggplot(df, aes(x=`Offense`))+geom_histogram(stat ="count")+theme(axis.text.x=element_text(angle=90
```

```
## Warning: Ignoring unknown parameters: binwidth, bins, pad
```

```
print(oc)
```



- Petit Larceny followed by Harrasement 2 and assault are the highest complaints recorded overall

9. How many victims are present in each age group?

```
ag <- table(df$`Victim age`)
print(ag)
```

```
##
##      -1      -3      -4     -48     -51     -61     -62    -921    -935    -943
##       2       1       1       2       1       1       1       1       1       1
##    -960     <18   18-24   25-44   45-64     65+     936     945     963     970
##       1   14408   39869  166937   90170   21532       1       1       1       1
## UNKNOWN
##  116573
```

- We can see that around 14 age group values do not align with reality, but this is a very small inconsistency comapred to the whole data.

- But what is concering is the 116573 unknown values(almost 1/3 of the data), this will affect the accuracy.

10. Which age group is most likely to be a victim?

```
ag[ag==max(ag)]
```

```
##  25-44
## 166937
```

- Of the known data, ages between 25 and 44 are most common victims of crimes with a count of 166937

10.1 Converting time column from character to time stamp

```
df$Time <- as.POSIXct(df$Time, format = "%H:%M:%S")
df$Time <- format(df$Time, "%H:%M:%S")
```

11. How many crimes are happening between 12am - 6am

```
df1 <- df %>% filter(Time < "06:00:00" & Time > "00:00:00")
head(df1)
```

```
##          ID      Borough       Date     Time Crime Status     Jurisdiction
## 1 276296223        BRONX 2020-12-01 00:01:00    COMPLETED N.Y. POLICE DEPT
## 2 694082264 NOT REPORTED 2020-10-02 01:25:00    COMPLETED N.Y. POLICE DEPT
## 3 474078722 NOT REPORTED 2020-09-16 05:15:00    COMPLETED N.Y. POLICE DEPT
## 4 843162354 NOT REPORTED 2020-09-15 01:13:00    COMPLETED N.Y. POLICE DEPT
## 5 715480292 NOT REPORTED 2020-08-26 01:34:00    COMPLETED N.Y. POLICE DEPT
## 6 644667510 NOT REPORTED 2020-08-14 04:11:00    COMPLETED N.Y. POLICE DEPT
##   Level of offense                        Offense      Premise Report Date
## 1           FELONY                DANGEROUS WEAPONS       STREET   12/1/2021
## 2           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   10/2/2021
## 3           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   9/16/2021
## 4           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   9/15/2021
## 5           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   8/26/2021
## 6           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   8/14/2021
##    Suspect age Suspect race  Suspect sex Victim age  Victim race  Victim sex
```

```
## 1 NOT REPORTED NOT REPORTED NOT REPORTED    UNKNOWN      UNKNOWN           E
## 2        25-44        BLACK            M      25-44        BLACK           M
## 3        25-44        BLACK            M      25-44        BLACK           M
## 4 NOT REPORTED NOT REPORTED NOT REPORTED      25-44        BLACK           M
## 5 NOT REPORTED NOT REPORTED NOT REPORTED      18-24        BLACK           M
## 6 NOT REPORTED NOT REPORTED NOT REPORTED      25-44        BLACK           M
##   Latitude Longtitude                             Cordinates year month day
## 1 40.89548  -73.87712  (40.89547629000003, -73.87712270799993) 2020    12  01
## 2 40.67462  -73.80428  (40.67461914900008, -73.80427786999996) 2020    10  02
## 3 40.69633  -73.93771 (40.696328949000076, -73.93771061299998) 2020    09  16
## 4 40.80536  -73.93766  (40.80536404400005, -73.93766276299993) 2020    09  15
## 5 40.69071  -73.78960 (40.690705110000074, -73.78960127299997) 2020    08  26
## 6 40.84932  -73.91236  (40.84932069000007, -73.91235948099995) 2020    08  14
```

11.1 Printing dimension and calculating percentage

```
print(nrow(df1))
```

```
## [1] 64501
```

```
print(nrow(df1)*100/nrow(df))
```

```
## [1] 14.34931
```

- There are totally 64501 crimes haepping between 12 am - 6 am, ie, past midnight and before early hours. This is 14.3% of all the crimes

12. How many Murders take place in this time frame?

```
df2 <- df1 %>% filter(df1$`Offense` == "MURDER & NON-NEGL. MANSLAUGHTER")
head(df2)
```

```
##          ID      Borough       Date     Time Crime Status     Jurisdiction
## 1 694082264 NOT REPORTED 2020-10-02 01:25:00    COMPLETED N.Y. POLICE DEPT
## 2 474078722 NOT REPORTED 2020-09-16 05:15:00    COMPLETED N.Y. POLICE DEPT
## 3 843162354 NOT REPORTED 2020-09-15 01:13:00    COMPLETED N.Y. POLICE DEPT
## 4 715480292 NOT REPORTED 2020-08-26 01:34:00    COMPLETED N.Y. POLICE DEPT
## 5 644667510 NOT REPORTED 2020-08-14 04:11:00    COMPLETED N.Y. POLICE DEPT
## 6 754095161 NOT REPORTED 2020-08-14 00:58:00    COMPLETED N.Y. POLICE DEPT
##   Level of offense                        Offense      Premise Report Date
## 1           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   10/2/2021
## 2           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   9/16/2021
## 3           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   9/15/2021
## 4           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   8/26/2021
```

```
## 5           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   8/14/2021
## 6           FELONY MURDER & NON-NEGL. MANSLAUGHTER NOT REPORTED   8/14/2021
##    Suspect age Suspect race  Suspect sex Victim age  Victim race  Victim sex
## 1        25-44        BLACK            M      25-44        BLACK           M
## 2        25-44        BLACK            M      25-44        BLACK           M
## 3 NOT REPORTED NOT REPORTED NOT REPORTED      25-44        BLACK           M
## 4 NOT REPORTED NOT REPORTED NOT REPORTED      18-24        BLACK           M
## 5 NOT REPORTED NOT REPORTED NOT REPORTED      25-44        BLACK           M
## 6 NOT REPORTED NOT REPORTED NOT REPORTED      25-44        BLACK           M
##   Latitude Longtitude                                Cordinates year month day
## 1 40.67462  -73.80428  (40.67461914900008, -73.80427786999996) 2020    10  02
## 2 40.69633  -73.93771 (40.696328949000076, -73.93771061299998) 2020    09  16
## 3 40.80536  -73.93766  (40.80536404400005, -73.93766276299993) 2020    09  15
## 4 40.69071  -73.78960 (40.690705110000074, -73.78960127299997) 2020    08  26
## 5 40.84932  -73.91236  (40.84932069000007, -73.91235948099995) 2020    08  14
## 6 40.59369  -73.75907  (40.59368532700007, -73.75907037999998) 2020    08  14
```

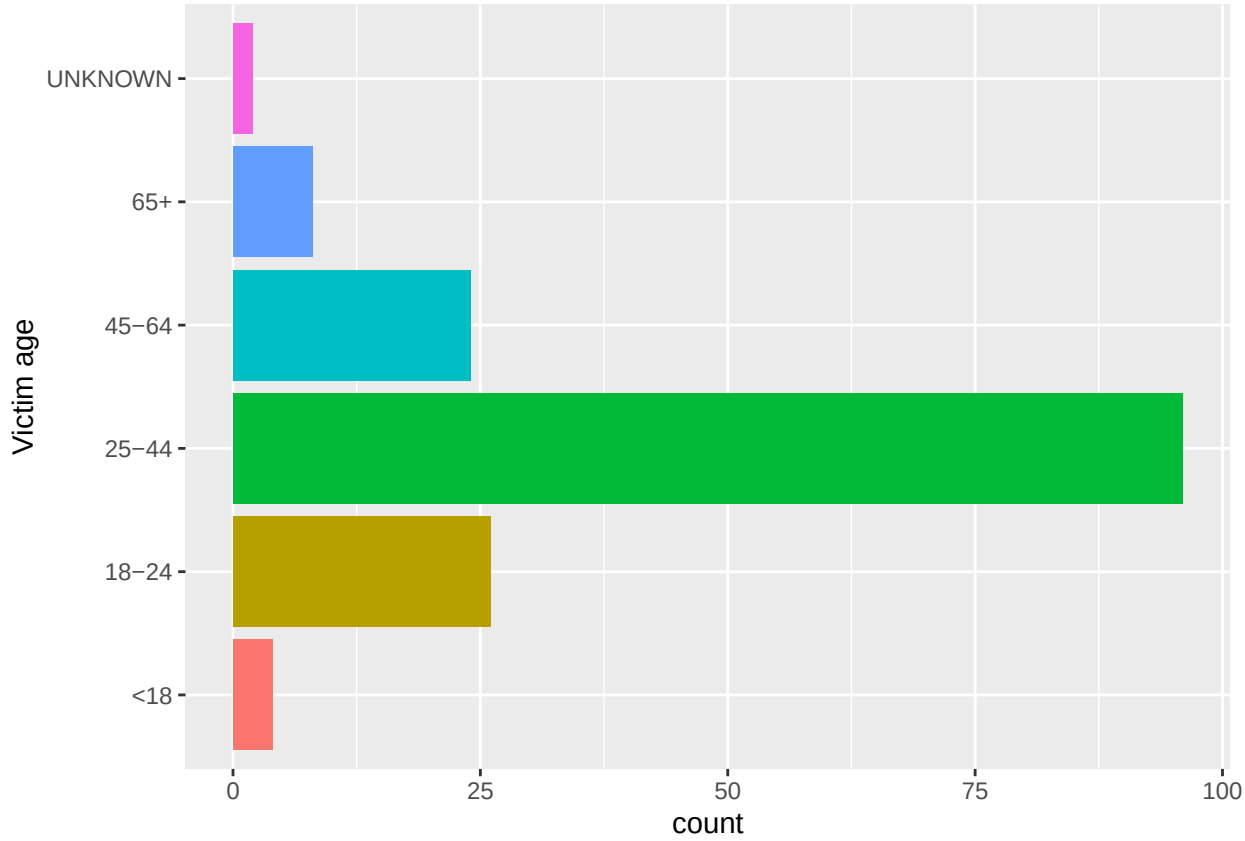
```r
print(nrow(df2))
```

```
## [1] 160
```

- 160 Of the 64501 crimes happening between 12 am 6 am are murders.

13. How many Murders happening between 12 am to 6 am per age group

```r
mg<-ggplot(df2, aes(x =`Victim age`, fill=as.factor(`Victim age`))) + geom_bar(width=0.9, stat="count")
print(mg)
```

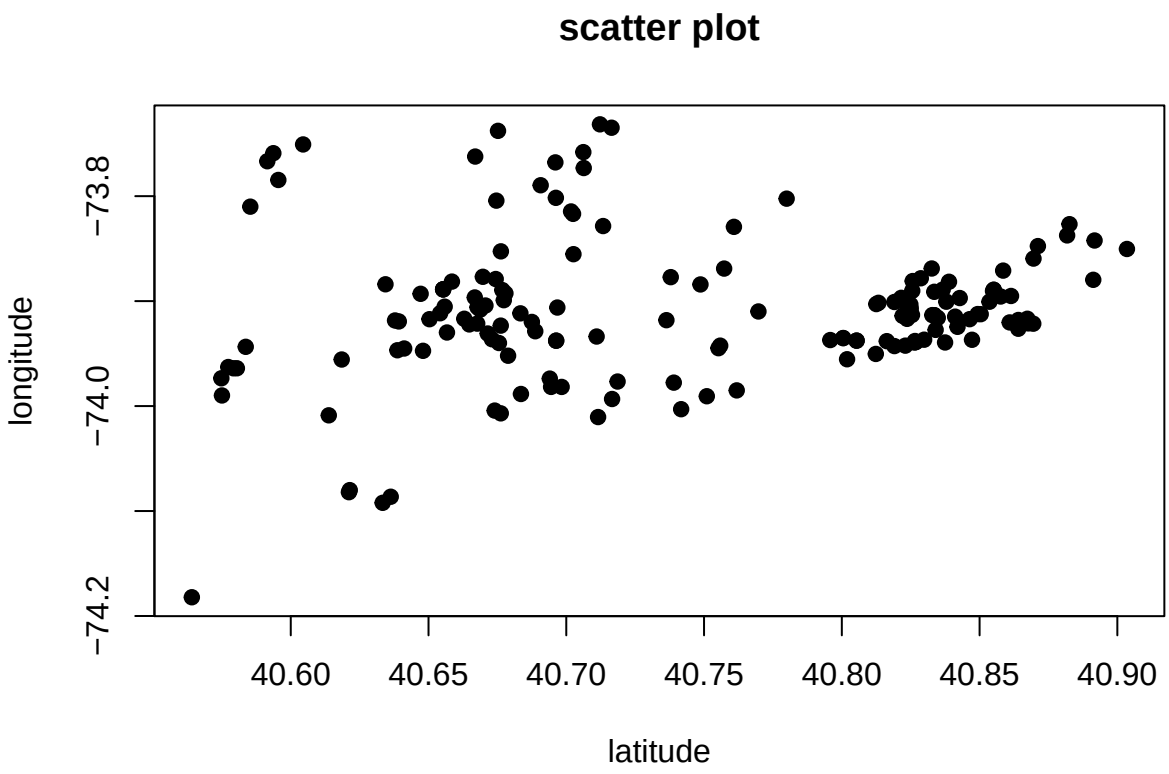


- Age groups between 25-44 are most vulnerable to muders after midnight and before daylight, and the least affected are below 18 and over 65. This could lead to some interesting and insightful analysis.

14. Distribution of the co-ordinates of the above crimes

14.1 Scatterplot:

```
x<- df2$Latitude
y<- df2$Longtitude
sp<-plot( x,y, main = "scatter plot", xlab = "latitude", ylab = "longitude", pch = 19)
```



15. How many street crimes occur by borough?

```
df3 <- df %>% filter(df$`Premise` == "STREET")
head(df3)
```

```
##          ID   Borough       Date     Time Crime Status     Jurisdiction
## 1 186105368     BRONX 2020-12-07 22:49:00    COMPLETED N.Y. POLICE DEPT
## 2 276296223     BRONX 2020-12-01 00:01:00    COMPLETED N.Y. POLICE DEPT
## 3 504183189 MANHATTAN 2020-09-12 16:55:00    COMPLETED N.Y. POLICE DEPT
## 4 180721837     BRONX 2020-07-06 16:15:00    COMPLETED N.Y. POLICE DEPT
## 5 300711837     BRONX 2020-02-13 15:15:00    COMPLETED N.Y. POLICE DEPT
## 6 187909876 MANHATTAN 2020-01-27 03:05:00    COMPLETED N.Y. POLICE DEPT
##   Level of offense           Offense Premise Report Date  Suspect age
## 1           FELONY DANGEROUS WEAPONS  STREET   12/7/2021 NOT REPORTED
## 2           FELONY DANGEROUS WEAPONS  STREET   12/1/2021 NOT REPORTED
## 3           FELONY           FORGERY  STREET   9/12/2021 NOT REPORTED
## 4           FELONY           ROBBERY  STREET    7/6/2021      UNKNOWN
## 5      MISDEMEANOR   DANGEROUS DRUGS  STREET   2/13/2021 NOT REPORTED
## 6           FELONY DANGEROUS WEAPONS  STREET   1/27/2021 NOT REPORTED
##   Suspect race  Suspect sex Victim age  Victim race  Victim sex Latitude
## 1 NOT REPORTED NOT REPORTED    UNKNOWN      UNKNOWN           E 40.88272
## 2 NOT REPORTED NOT REPORTED    UNKNOWN      UNKNOWN           E 40.89548
## 3 NOT REPORTED NOT REPORTED    UNKNOWN      UNKNOWN           E 40.72351
```

```
## 4      UNKNOWN            U      25-44        BLACK           M 40.83296
## 5 NOT REPORTED NOT REPORTED    UNKNOWN      UNKNOWN           E 40.85810
## 6 NOT REPORTED NOT REPORTED    UNKNOWN      UNKNOWN           E 40.80766
##   Longtitude                                 Cordinates year month day
## 1  -73.88125  (40.88271780700006, -73.88124724999993) 2020    12  07
## 2  -73.87712  (40.89547629000003, -73.87712270799993) 2020    12  01
## 3  -73.97928  (40.72351435300004, -73.97928228099995) 2020    09  12
## 4  -73.86655  (40.83295947800008, -73.86654894899993) 2020    07  06
## 5  -73.90191 (40.858100827000044, -73.90191494099997) 2020    02  13
## 6  -73.93925  (40.80766222600005, -73.93925001599996) 2020    01  27
```

15.1 Calculating percentage

```
print(nrow(df3))
```

```
## [1] 127641
```

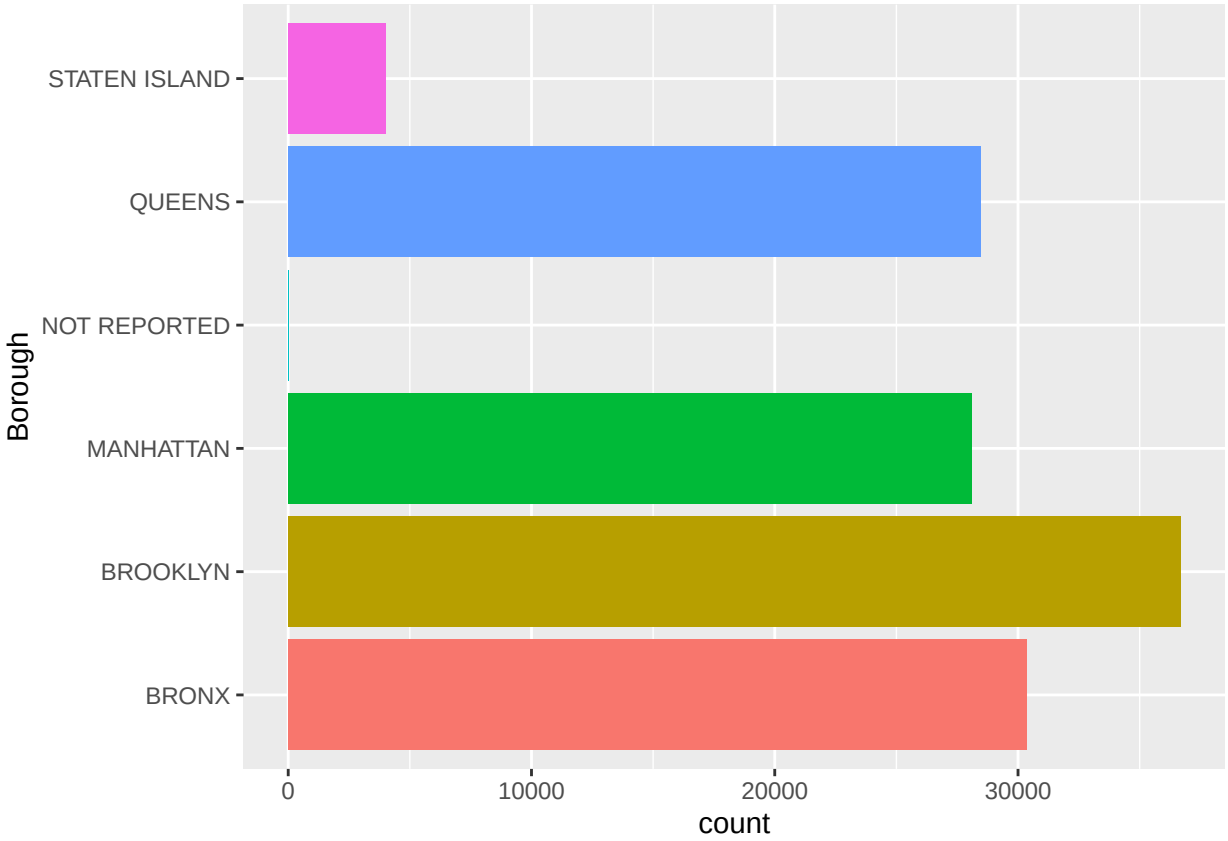
```
print(nrow(df3)*100/nrow(df))
```

```
## [1] 28.39584
```

- There are 127641 street crimes, which accounts to 28.4% of total crimes recorded

15.2 Histogram of street crimes by borough

```
sb<-ggplot(df3, aes(x = `Borough`, fill=as.factor(`Borough`))) + geom_bar(width=0.9, stat="count") + th
print(sb)
```



- Brooklyn has the most street crimes followed by Bronx.

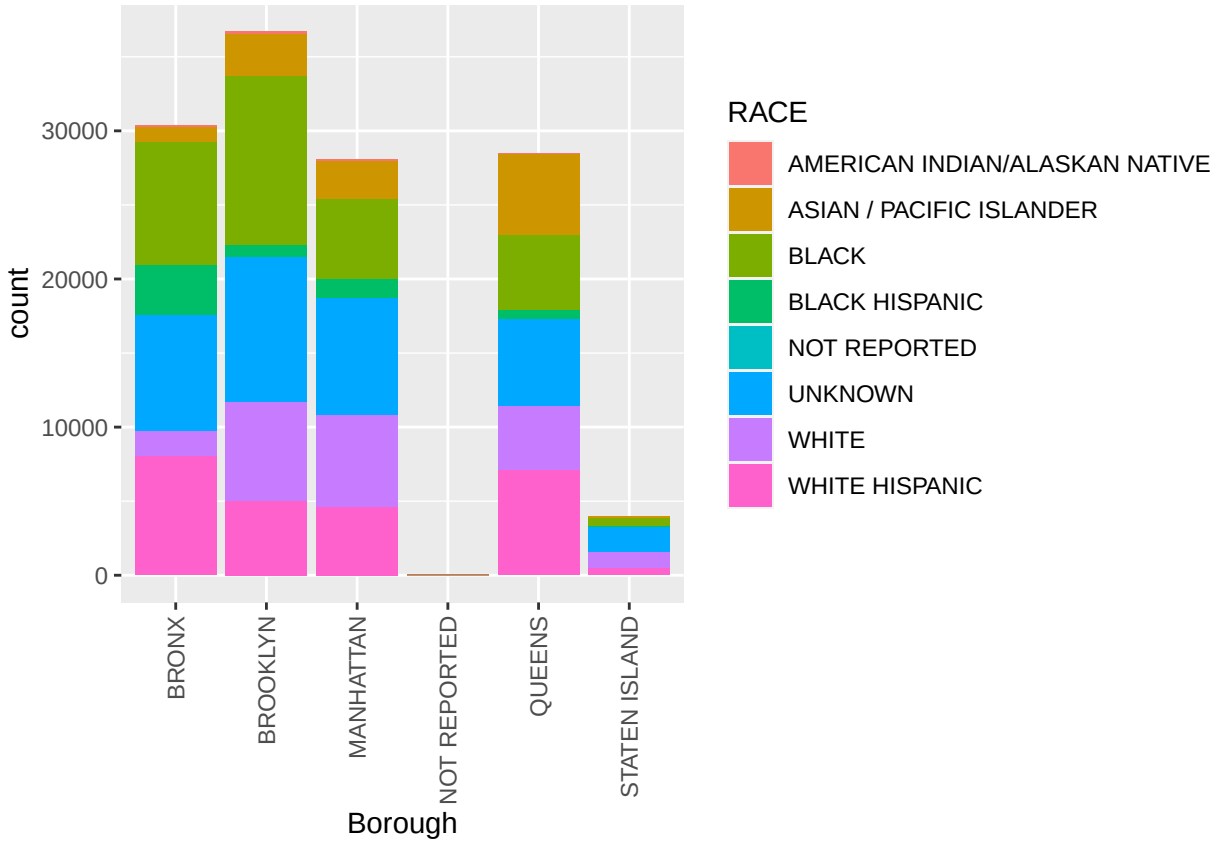
- Staten island has the least, with less than 5000 street crimes recorded.

16. What are the races of victims of street crimes?

```
sr<- ggplot(data=df3,aes(x=`Borough`,fill=` Victim race`))+geom_histogram(stat="count")+ scale_fill_dis
```

```
## Warning: Ignoring unknown parameters: binwidth, bins, pad
```

```
print(sr)
```


count
30000
20000
10000
0
BRONX
BROOKLYN
MANHATTAN
NOT REPORTED
QUEENS
STATEN ISLAND
Borough
RACE
AMERICAN INDIAN/ALASKAN NATIVE
ASIAN / PACIFIC ISLANDER
BLACK
BLACK HISPANIC
NOT REPORTED
UNKNOWN
WHITE
WHITE HISPANIC

- In Bronx and Brooklyn, the race most affected by street crimes are Black

CONCLUSIONS:

Which borough has the highest and lowest number of crimes?

- Brooklyn and Staten Island

Which departments are solving crimes by month?

- N.Y. Police department

Which age group is most likely to be a victim?

- 25-44

How many crimes are happening between 12am - 6am

- 64501, 14.3% of all recorded crimes

How many Murders take place in this time frame?

- 160 murders

What is the race of most/least victims of street crimes?

- Most victims are Black and least are American indians/Alaskan natives.