NYPD Shooting Incident Data Analysis

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2023-06-24

This dataset includes every shooting incident in NYC from 2006 to 2022. In this report I will explore NYPD Shooting Report Incident Data to identify patterns and trends in gun violence in NYC. Insights derived by data analytics can be used to drive informed policing methods and policy.

Necessary packages for this analysis: tidyverse core packages.

Step 0: Import Library

```
##install.packages("tidyverse") to install
library(tidyverse)
```

Step 1: Read in Data

Begin by reading in data from csv file from the City of New York.

```
NYPD_data <- read_csv("https://data.cityofnewyork.us/api/views/833y-fsy8/rows.csv?accessType=DOWNLOAD")
```

Step 2: Clean and Transform Data

Select only columns relevant to our investigation of this data

```
NYPD_data <- NYPD_data %>% mutate(OCCUR_DATE= mdy(OCCUR_DATE)) %>% select(-c(JURISDICTION_CODE,INCIDENT
```

Rename Date and time

```
NYPD_data <- NYPD_data %>% rename(Date = OCCUR_DATE, Time = OCCUR_TIME)
```

Filter out NA and UNKNOWN variables

```
NYPD_data_tidy <- NYPD_data %>% drop_na()
# filter out Unknown vic age group variables
NYPD_data_tidy <- NYPD_data_tidy %>% filter(!grepl('UNKNOWN', VIC_AGE_GROUP))
NYPD_data_tidy <- NYPD_data_tidy %>% filter(!grepl('1022', VIC_AGE_GROUP))
```

Summary of our cleaned data

```
summary(NYPD_data_tidy)
```

```
##       Date                Time              BORO           PERP_AGE_GROUP
##  Min.   :2006-01-01   Length:17911      Length:17911       Length:17911
##  1st Qu.:2008-08-06   Class1:hms        Class :character   Class :character
##  Median :2011-11-17   Class2:difftime   Mode  :character   Mode  :character
##  Mean   :2013-05-12   Mode  :numeric
##  3rd Qu.:2018-04-28
##  Max.   :2022-12-31
##    PERP_SEX         VIC_AGE_GROUP        VIC_SEX
##  Length:17911       Length:17911       Length:17911
##  Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character
##
##
##
```

Step 3: Add Analysis and Visualization

Lets sort victim age groups in descending order by total number, to see which age group has the most instances.

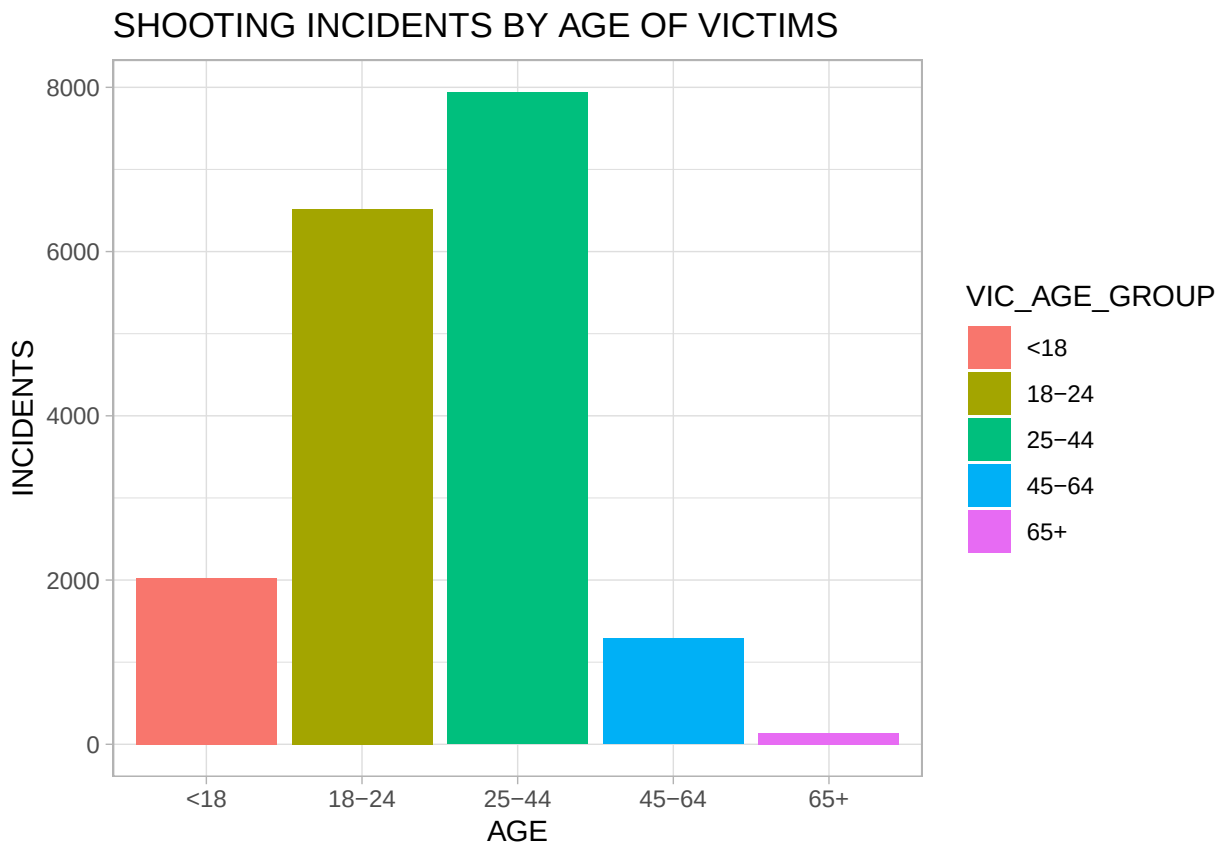
```
NYPD_data_tidy %>% group_by(VIC_AGE_GROUP) %>% summarise(Total=n()) %>% arrange(desc(Total))
```

```
## # A tibble: 5 x 2
##   VIC_AGE_GROUP Total
##   <chr>         <int>
## 1 25-44          7939
## 2 18-24          6518
## 3 <18            2027
## 4 45-64          1290
## 5 65+             137
```

Create a bar chart to visualize instances per age group.

```
vic_age_data <- NYPD_data_tidy %>% group_by(VIC_AGE_GROUP) %>% summarize(incidents = n())

ggplot(vic_age_data, aes(x=VIC_AGE_GROUP, y=incidents, fill=VIC_AGE_GROUP)) +
  geom_bar(stat = "identity") +
  xlab("AGE") + ylab("INCIDENTS") +
  ggtitle("SHOOTING INCIDENTS BY AGE OF VICTIMS")+
  theme_light()
```



I want to see which age group has the highest chance of becoming a victim of a shooting. I begin by creating a population column for each age range.

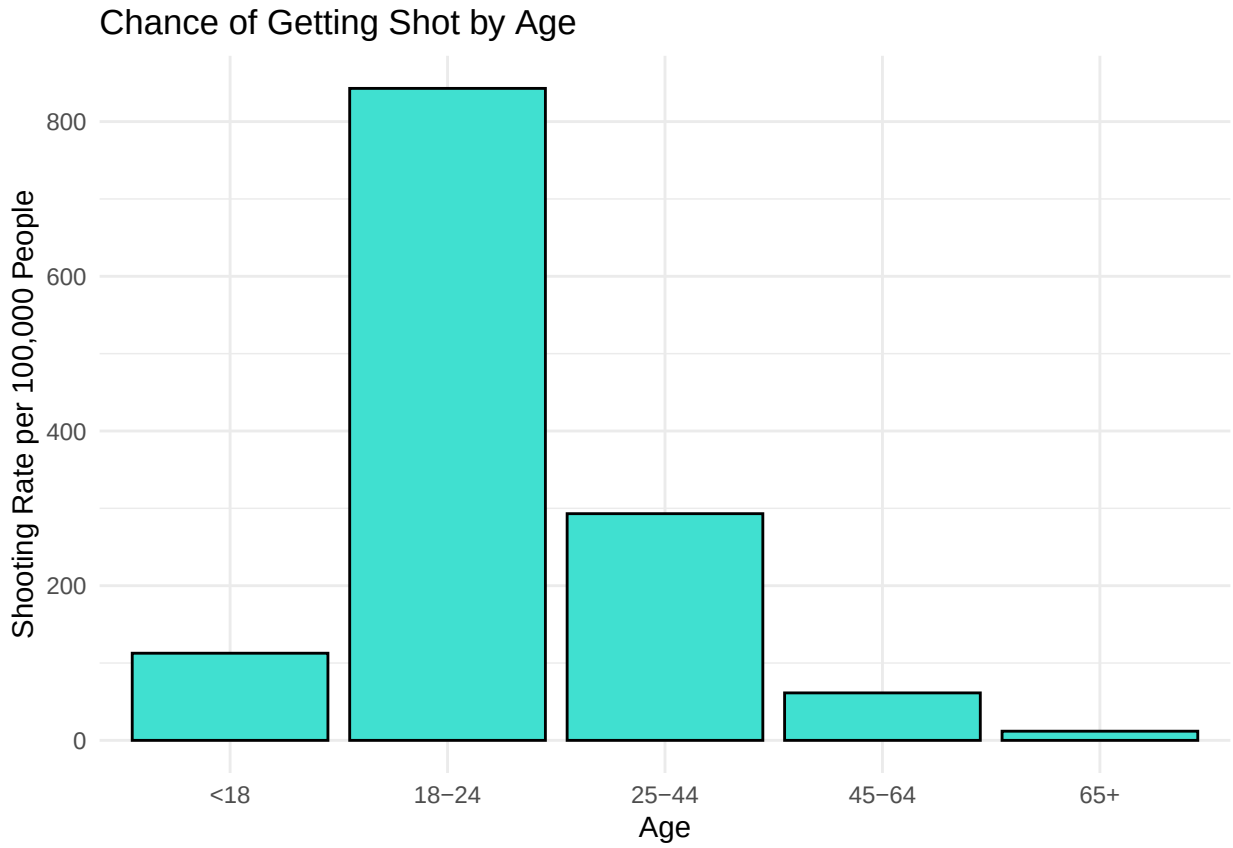
```
NYPD_data_tidy <- NYPD_data_tidy %>%
  mutate(Population = case_when(
    VIC_AGE_GROUP == "<18" ~ 1798842,
    VIC_AGE_GROUP == "18-24" ~ 773258,
    VIC_AGE_GROUP == "25-44" ~ 2708853,
    VIC_AGE_GROUP == "45-64" ~ 2101599,
    VIC_AGE_GROUP == "65+" ~ 1155075,
    TRUE ~ NA_real_
  ))
```

Next I calculate and plot the shooting incident rate per 100,000 people for each age group.

```
vic_age_data_rate <- NYPD_data_tidy %>%
  group_by(VIC_AGE_GROUP) %>%
  summarise(total_shootings = n(),
            population = unique(Population),
            shooting_rate = total_shootings / (population / 100000)) %>%
  arrange(desc(shooting_rate))

ggplot(vic_age_data_rate, aes(x = VIC_AGE_GROUP, y = shooting_rate)) +
  geom_bar(stat = "identity", fill = "turquoise", color = "black") +
  ggtitle("Chance of Getting Shot by Age") +
  xlab("Age") +
```

```
  ylab("Shooting Rate per 100,000 People") +
  theme_minimal()
```



Conclusion: The 25-44 year old age group has the highest overall incident count, slightly edging out 18-24. Once adjusted to shooting incidents per 100,000, 18-24 year old are at a significantly higher chance of being a victim of gun violence in NYC than any other age group.

Which sex is most likely to become a victim of gun crime in NYC?

```
table(NYPD_data_tidy$VIC_SEX)
```

```
##
##     F     M     U
##  1918 15990     3
```

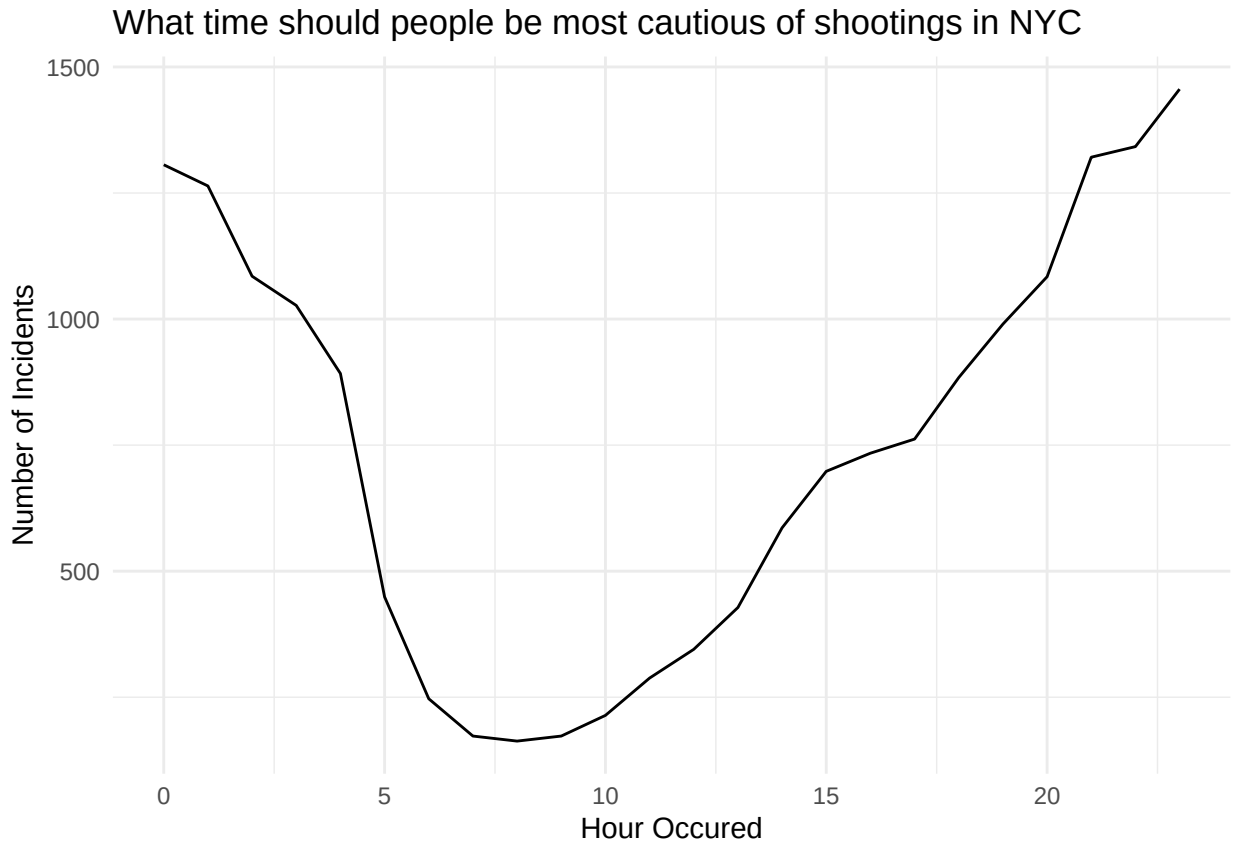
Now I would like to see what time of day that shootings are most likely to occur.

```
NYPD_data_tidy$HOUR = hour(hms(as.character(NYPD_data_tidy$Time)))

occur_hour = NYPD_data_tidy %>% group_by(HOUR) %>% count()

ggplot(occur_hour, aes(x=HOUR, y=n)) +
  geom_line() +
  labs(title = "What time should people be most cautious of shootings in NYC",
       x = "Hour Occured",
```

```
       y= "Number of Incidents") +
  theme_minimal()
```



Conclusion: The highest risk of gun violence occurs after dark. With a significant risk increase beginning in the evening hours, and remaining high until a steep decline beginning around 4 AM.

Create linear regression model and print results.

```
NYPD_data_tidy <- NYPD_data_tidy %>%
  mutate(Total = ifelse(!is.na(VIC_AGE_GROUP), 1, 0)) %>%
  group_by(VIC_AGE_GROUP) %>%
  mutate(Total = cumsum(Total))

lm_model <- lm(Total ~ Population, data = NYPD_data_tidy)

summary(lm_model)
```

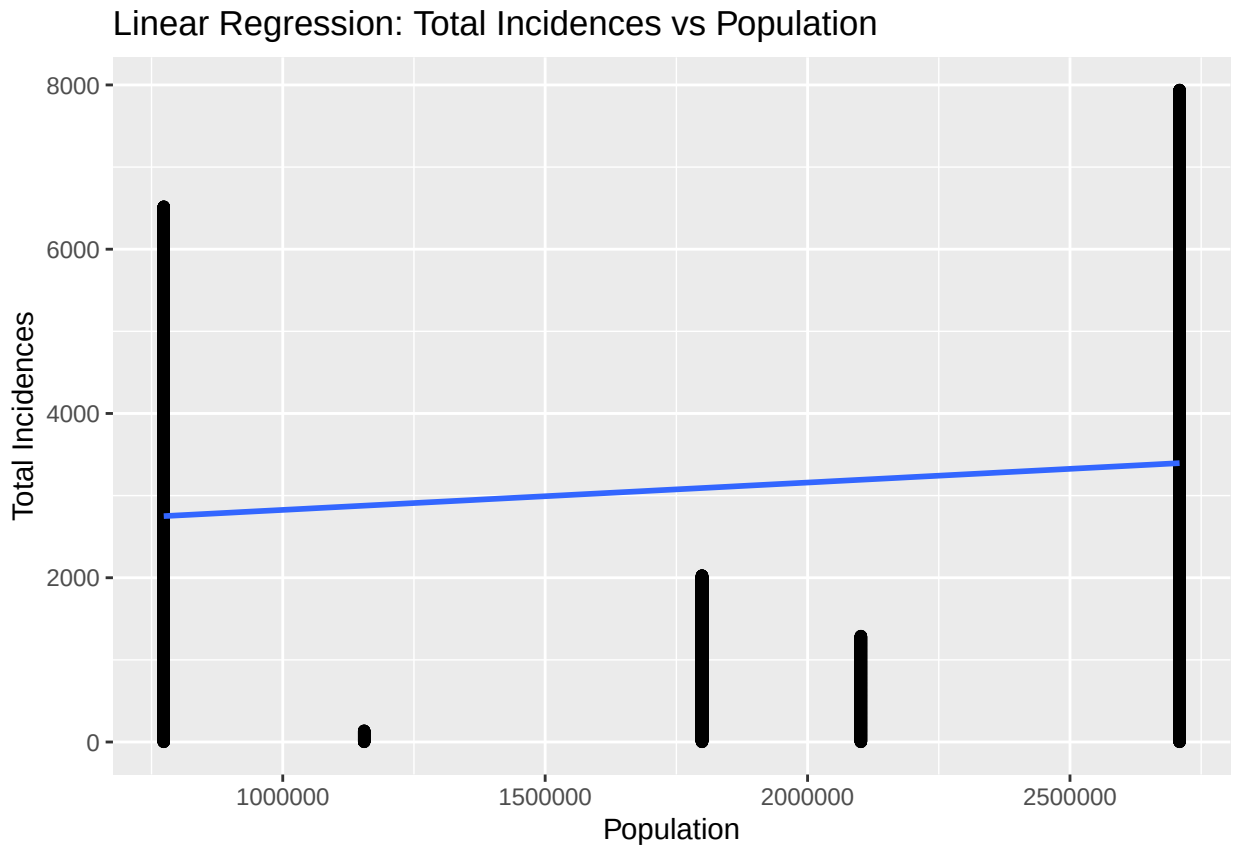
```
##
## Call:
## lm(formula = Total ~ Population, data = NYPD_data_tidy)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3394.3 -2021.9  -321.3  1917.3  4543.7
##
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 2.492e+03  3.888e+01   64.11   <2e-16 ***
## Population  3.333e-04  1.905e-05   17.50   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2219 on 17909 degrees of freedom
## Multiple R-squared:  0.01681,    Adjusted R-squared:  0.01675
## F-statistic: 306.1 on 1 and 17909 DF,  p-value: < 2.2e-16
```

Creating a scatter plot with linear regression.

```
ggplot(NYPD_data_tidy, aes(x = Population, y = Total)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE) +
  xlab("Population") +
  ylab("Total Incidences") +
  ggtitle("Linear Regression: Total Incidences vs Population")
```

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



Step 4: Identify Any Potential Bias

As a male in my twenties I might think that I am at a lower risk of becoming a target of crime in NYC. Through analysis, this prior assumption has been proven incorrect for gun violence. Men are 8.3x more likely

to be a victim of a shooting in NYC. More specifically, a male between the ages of 18-24 is at a significantly higher risk of getting shot than any other group.