

Patrolling New York State

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Problem Statement

What is the scale of the 2016-17 increase in crime violence and what are the factors that influence NYS crime rate in 2017?

Description of the data

Index, Violent, Property, and Firearm Rates By County: Beginning 1990

This data is provided by the New York State Division of Criminal Justice Services and is based on crime reports from more than 500 New York State and sheriffs' departments ¹. This annually updated dataset collects information on seven crimes classified as Index crimes. The two category of crimes are **violent crimes** (murder/non-negligent manslaughter, forcible rape, robbery, and aggravated assault) and **property crimes** (burglary, larceny, and motor vehicle theft).

¹"Index, Violent, Property, and Firearm Rates By County: Beginning 1990." State University of New York (SUNY) Campus Locations with Websites, Enrollment and Select Program Offerings | Open Data NY, DATA.NY.GOV, 25 Nov. 2018, data.ny.gov/Public-Safety/Index-Violent-Property-and-Firearm-Rates-By-County/34dd-6g2j.

Comparison of 2000 and 2010 Populations by Race and Ethnicity

This dataset is obtained from the New York State Department of Labor, which sources its information from the 2000 and 2010 Census. The data compares the New York State, Regional, and County Populations by Race and Ethnicity (in this case, percentage of White, Black, Asian, Hispanic).

Quarterly Census of Employment and Wages Annual Data: Beginning 2000

This data is collected from the Quarterly Census of Employment and Wages program, a cooperative program with the U.S. Bureau of Labor Statistics, which collects employment and wage data. This data provides a virtual census of employees and their wages as well as the most complete universe of employment and wage data, by industry, at the State, regional and county levels ².

Scale of Increase: 2001-17 In-Depth

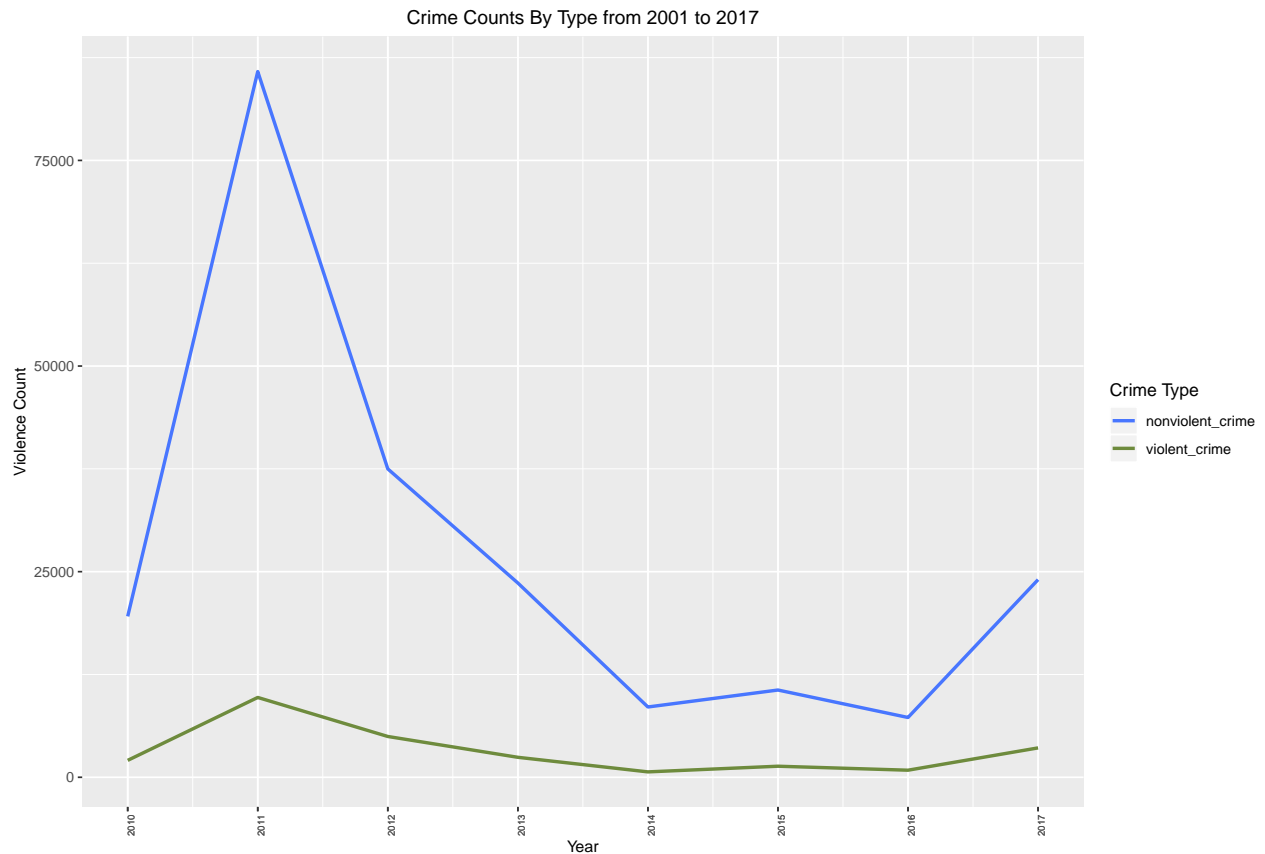
To further understand the increase of crime rate and to better visualize the seemingly linear decrease in crime rate from 1990 to 2017 (seen in the coverage), we graphed crime count from 2001 to 2017.

Crime Time-series

```
# violent and non-violent crimes
crime_types <- violence %>%
  filter(Year==c(2010:2017)) %>%
  group_by(Year) %>%
  drop_na() %>%
  mutate(violent_crime=sum(Violent.Count),
         nonviolent_crime=sum(Property.Count)) %>%
  distinct(violent_crime, nonviolent_crime) %>%
  gather(key="crime_type", value="count", violent_crime:nonviolent_crime)

ggplot(crime_types, aes(x=Year, y=count)) +
  geom_line(aes(color=crime_type), size=1)+
  labs(x="Year", y="Violence Count",
       title="Crime Counts By Type from 2001 to 2017", color="Crime Type")+
  scale_x_continuous(breaks=(crime_types$Year))+
  theme(plot.title = element_text(size = 12, hjust = 0.5),
        axis.title.x = element_text(size = 10),
        axis.text.x = element_text(angle = 90, size=6),
        axis.title.y = element_text(size = 10))+
  scale_color_manual(values = c("royalblue1", "darkolivegreen4"))
```

²“Quarterly Census of Employment and Wages Annual Data: Beginning 2000.” State University of New York (SUNY) Campus Locations with Websites, Enrollment and Select Program Offerings | Open Data NY, DATA.NY.GOV, 14 Nov. 2018, data.ny.gov/Economic-Development/Quarterly-Census-of-Employment-and-Wages-Annual-Da/shc7-xcbw.



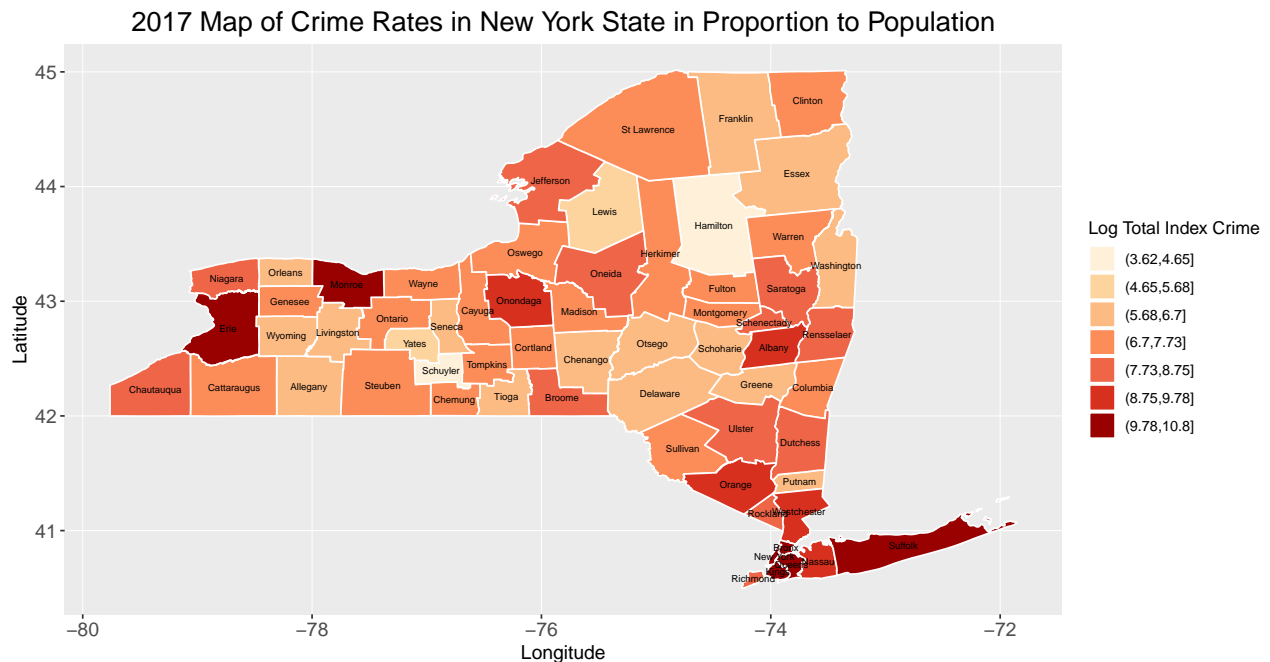
This time series line graph shows that the 2016-17 increase in crime rates seem to be less significant than initially expected. In the overall 1990 picture, peaks in crime rate were counterbalanced with declines; as a result, the upward slope in 2016-17 was especially visible. This means that surveillance and increased defense spending did not reduce crime violence to the extent that there was no increase in crime during 1990 to 2016 in NYS.

Map of Crime Rates per Capita

```
# some data wrangling
# for year 2017
violence_county <- violence %>%
  select(County, Index.Rate, Year) %>%
  filter(Year==2017) %>%
  right_join(newyork_pop, by="County") %>%
  # "num_unit" stands for the number of units (100,000)
  mutate(num_unit=estimate/100000,
         # "total_index" stands for the total index crime for that county
         total_index=Index.Rate*num_unit,
         log_index=round(log(total_index), 2)) %>%
  # make it discrete
  mutate(index_discrete=cut(log_index, breaks=7))

# plot using sf
ggplot() +
  geom_sf(data = violence_county, aes(fill = index_discrete), size = 0.5, color = "white") +
```

```
geom_text(data = violence_county, aes(x=lon, y=lat, label = County), color = "black", size = 2) +
scale_fill_brewer(type = "seq", palette = "OrRd", direction = 1) +
labs(title = "2017 Map of Crime Rates in New York State in Proportion to Population",
fill = "Log Total Index Crime",
x = "Longitude", y = "Latitude")+
theme(plot.title = element_text(size = 17, hjust = 0.5),
axis.text.x = element_text(size = 12), axis.title.x = element_text(size = 12),
axis.text.y = element_text(size = 12), axis.title.y = element_text(size = 12))
```



We graphed the Index Rate for the year 2017 to see counties with the most crime per capita.

White(1)= lowest ; Dark-Red(7)= highest

Possible Crime Influences- 2017

Income and Crime Rates

```
# Mean wage by county, year 2017
income_short <- income %>%
  filter(Area.Type=="County", Year=="2017") %>%
  select(-NAICS, -NAICS.Title) %>%
  group_by(Area) %>%
  mutate(county_mean_wage=mean(Annual.Average.Salary)) %>%
  distinct(Area, county_mean_wage) %>%
  arrange(county_mean_wage)
# top 10 lowest income counties
income_short1 <- income_short[1:10, ]
# rename vars for display
# 10 lowest wage county
income_short1 <- income_short1 %>%
  rename(County=Area, Mean_wage=county_mean_wage)
```

```

# 10 highest wage county
income_short2 <- income_short[53:62, ]
income_short2 <- income_short2 %>%
  rename(County=Area, Mean_wage=county_mean_wage)
# side-by-side
income_comparison <- cbind(income_short1, income_short2)
income_comparison <- income_comparison %>%
  rename(County_low=County, County_high=County1,
         Low_mean_wage=Mean_wage, Top_mean_wage=Mean_wage1)
income_comparison

```

```

## # A tibble: 10 x 4
## # Groups:   County_low [10]
##   County_low      Low_mean_wage County_high      Top_mean_wage
##   <fct>          <dbl> <fct>          <dbl>
## 1 Hamilton County      28950. Kings County      50589.
## 2 Schuyler County      31505. Bronx County      51139.
## 3 Yates County        32289. Monroe County      51895.
## 4 Allegany County      33870. Albany County      53947.
## 5 Tioga County         34053. Rockland County      54103.
## 6 Lewis County         34188. Queens County      54484.
## 7 Oswego County        34511. Suffolk County      63133.
## 8 Delaware County      34710. Nassau County      63333.
## 9 Livingston County    35020. Westchester County  72193.
## 10 Orleans County      35077. New York County    95290.

```

The table depicts counties with the 10 highest and lowest mean wage in 2017. Hamilton and Schuyler, the lightest colored counties on the map, have the least mean wages. The lowest waged 10 counties range from white(1) to orange(4), and the highest from orange(4) to dark-red(7).

The data is surprising as people usually associate poorer regions with more crime, but the data seems to demonstrate that the higher the wage, the higher the crime rates per capita. Does this correlation prove causation, or is this association a mere coincidence?

Population and Crime Rates

```

# year 2017
pop <- violence %>%
  filter(Year=="2017") %>%
  select(County, Population) %>%
  arrange(desc(Population))

pop1 <- pop[53:62, ]
pop1 <- pop1 %>%
  rename(Low_population=Population)
pop2 <- pop[1:10, ]
pop2 <- pop2 %>%
  rename(Top_population=Population)
pop_comparison <- cbind(pop1, pop2)
row.names(pop_comparison) <- NULL
pop_comparison

```

	County	Low_population	County	Top_population
## 1	Delaware	44468	Kings	2646816

## 2	Orleans	41194	Queens	2356841
## 3	Wyoming	40666	New York	1663498
## 4	Essex	36491	Suffolk	1495619
## 5	Seneca	34779	Bronx	1470074
## 6	Schoharie	31166	Nassau	1367901
## 7	Lewis	26893	Westchester	980819
## 8	Yates	24910	Erie	923447
## 9	Schuyler	18106	Monroe	749892
## 10	Hamilton	4505	Richmond	479104

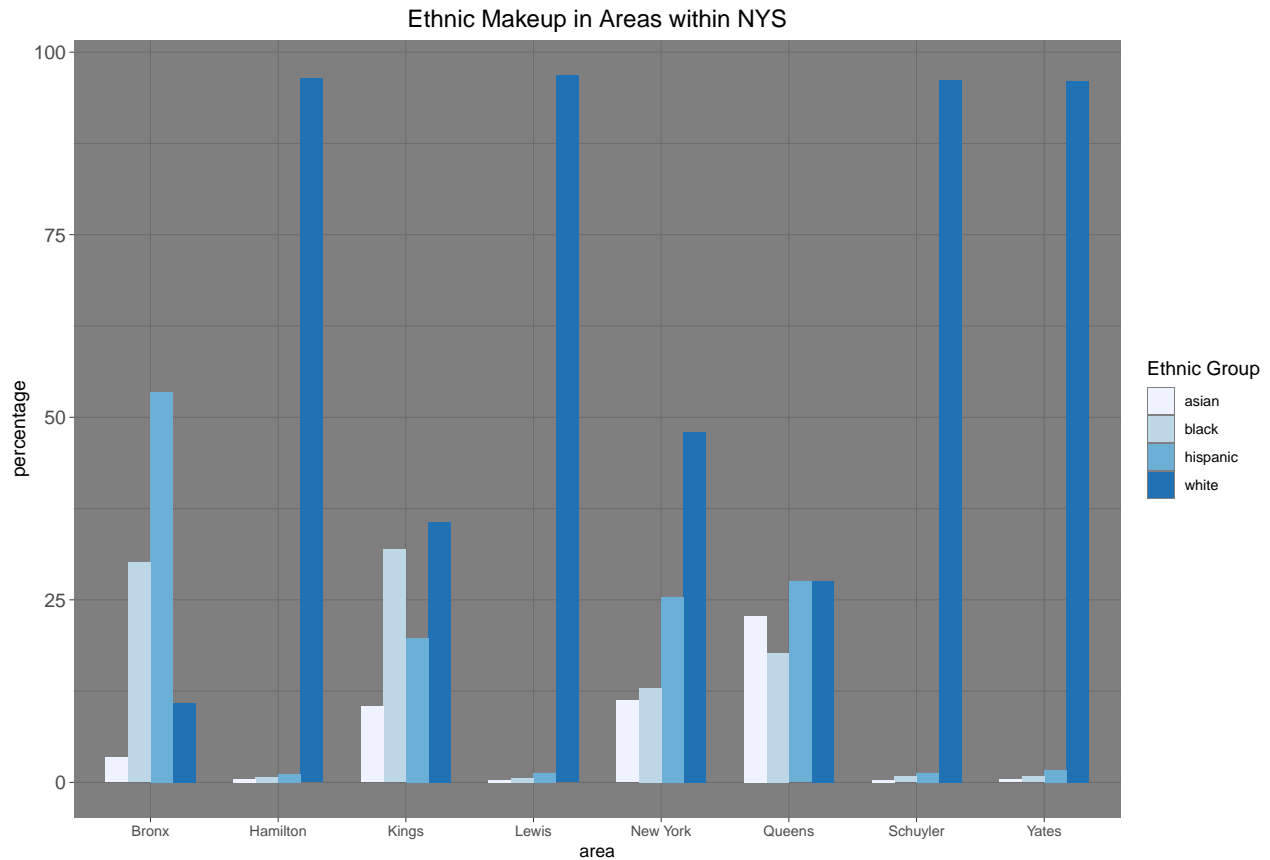
In 2017, 8 out of 10 counties with the highest population had the highest mean wage per worker, and 6 out of 10 lowest population had the lowest mean wage. The two counties, Erie and Richmond are dark-red(7) and dark-orange(5) respectively. Hamilton and Schuyler have the lowest population. Note that the crime range for highest population is dark-orange(5) to dark-red(7).

Population seems to have a closer correlation to danger than Income since the color gradient for crime rate per capita is more compact (5-7 as opposed to 4-7).

Ethnicity and Crime Rates

```
# we picked out several dangerous regions and look at the ethnic make-up
# from 2010 census
ethnicity1 <- ethnicity %>%
  mutate(Area=as.factor(X)) %>%
  filter(Area %in% c("Hamilton", "Schuyler", "Lewis", "Yates",
                    "Kings", "Queens", "New York", "Bronx")) %>%
  select(Area, Population, X2010:X.9) %>%
  rename(white=X2010, black=X.7, asian=X.8, hispanic=X.9) %>%
  gather(key="group", value="percentage", white:hispanic) %>%
  mutate(percentage=parse_number(percentage))

ggplot(data=ethnicity1, aes(x=Area, y=percentage, fill=group))+
  geom_bar(position="dodge", stat="identity", width=0.7)+
  scale_fill_brewer()+theme_dark()+
  labs(title="Ethnic Makeup in Areas within NYS",
       fill="Ethnic Group",
       x="area", y="percentage")+
  theme(plot.title=element_text(size=15, hjust=0.5),
        axis.text.y=element_text(size=12), axis.title.y=element_text(size=12),
        legend.title=element_text(size=12))
```



Conclusion

The scale of the 2016-17 increase in NYS crime violence is negligible in closer examination. Wage, population and crime rate per capita seem to have a correlation: the higher the earnings and the higher the county's population size, the higher the crime per capita. The correlation between wage and population is self-evident; more populated counties provide higher quantities and varieties of job opportunities. A possible explanation for the correlation between population and crime rates could be that job opportunities vary (thus, inequality), or that denser populations lead to increased competition and a higher cost of living (thus, cost of living negates wages).

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