**Recommendation for the efficient deployment of the police force with the aim of reducing overall crimes occurrences in Washington D.C.**

**Done by:**

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**For PCPP Module 6 Capstone Project**

**Problem**

The number of police officers serving in the Washington D.C. state police department had been declining, either through retirement, resignation, disability or death. 4,0221 police officers were serving in the police department in 2008 and in 2017, there were only 3,8371 police officers. In 2017, these police officers were serving a population of 693,9722 people in Washington D.C.. Manpower resources have clearly been overstretched. And with the number of police officers hired being lower than that of the attrition rate, there is a need to look into the efficient deployment of the current pool of police officers in order to keep Washington D.C. state safe.

**Objective**

In this report we hope, through the analysis of the data relating to the offenses in Washington D.C. from 2008 to 2017, to make a recommendation for the efficient deployment of the police force with the aim of lowering the overall number of offenses occurring in Washington D.C..

**Hypothesis**

1. Has there been a decrease in violent crimes over the years?
2. Response time for violent crimes might be too long given the limited manpower resources.
3. Are there any districts that are more dangerous than others?
4. Offenses are generally committed in the evening and midnight shift.

**Method used in the treatment of the data**

We created a function to load the csv to pandas dataframe. Based on the statistics generated from the dataframe, there is a total of 342,867 data points, each instance capturing a single crime that is conducted in the State of Washington DC.

The serial number fields (‘Unnamed : 0, ‘X’) do not seem to be useful to the dataset, and is hence dropped. Likewise, the “optional” field is TRUE for all data points. After the removal, there are a total of 29 columns left each representing a single field.

Using the function *checkMissingData()* , a “missing field” test is performed on every column. There is a total of 8 columns with missing fields, and the number of data points missing are shown below:

1. DISTRICT missing data: 200
2. PSA missing data: 251
3. NEIGHBORHOOD\_CLUSTER missing data: 4705
4. BLOCK\_GROUP missing data: 1091
5. CENSUS\_TRACT missing data: 1091
6. VOTING\_PRECINCT missing data: 84
7. START\_DATE missing data: 13
8. END\_DATE missing data: 11651

Given that these fields might not be as important in our analysis, it shall be dealt with on a case-by-case basis. Also, the maximum number of missing data, 11651, of the end date of the crime, represents only 3.3% of the total data points. Hence, missing data is a relatively minor problem in this dataset.

**Generating the data for Crime Trend**

Apply the .groupby() method thru the function *three\_plot()*, to count each single row for every year from 2008 to 2017, and find the crime frequency in the entire year.

**Getting Response Time Data**

Apply the datetime function to the date string on both the Report Date and Crime Start Date fields.   
Use np.mean and np.std to get the mean and standard deviation of crime response time for violent and non-violent crimes. The standard error is given by std / sqrt(n).

**Are there any districts that are more dangerous than others?**

We define a district as dangerous, relative to another district, if it has a higher proportion of crimes.

We filter the dataframe by violent and non-violent crimes, and obtain the frequency of the violent and non-violent crimes conducted in every district.

**Offenses are generally committed in the evening and midnight shift.**

For this we define the total crime count, and group it by the SHIFT dataset to determine whether there is a higher proportion of crimes committed in any of the shifts.

**Findings**

**Has there been a decrease in violent crimes over the years?**

From the figure below, it can be seen that the violent crime type has decreased over the years whilst there is a corresponding increase in non-violent crimes.

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***Figure 1: Violent and Non-violent crimes in Washington D.C. from 2008 to 2017***

**Response time for violent crimes might be too long given the limited manpower resources**

From Figure 2, it is clear the response time of violent crimes (about 150 minutes) is much lower than that of non-violent crimes (at about 425 minutes).

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***Figure 2: Violent and Non-violent crimes in Washington D.C. from 2008 to 2017***

**Are there any districts that are more dangerous than others?**

A district is dangerous relative to another district, if it has a higher proportion of crimes.

From Figure 3, the dangerous districts are districts 1 and 3.

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***Figure 3: Number of crimes in the different districts in Washington D.C. from 2008 to 2017***

The heat map below shows that there are high instances of crime in districts 1 and 3.

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***Figure 4: Number of crimes in the different districts in Washington D.C. from 2008 to 2017***

**Offenses are generally committed in the evening and midnight shift.**

Evening shifts generally have the highest number of offenses as seen from Figure 5.

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***Figure 5: Offenses in the different shifts***

**Recommendations**

From the above analysis, we recommend that the police department should consider increasing the number of police officers on patrol as well as the frequency of the patrols for districts 1 and 3. Also, increase the number of police officers on patrol in the evening shifts for the whole of Washington D.C..

**Conclusion**

It is hoped that, with the increase in the number of police officers and the frequency of the patrols, and by efficiently locating the officers in areas where there is a high occurrence of offenses, the number of offenses in Washington D.C. could be effectively brought down. As this will be a strong deterrent to recalcitrant criminals who think that they can get away with their crimes due to a lack of manpower in the police department. However, there might be budget constraints with regards to the implementation of the recommendations put forth in this report, this report could also serve as an insight for the Washington D.C. state government on how they could utilize their current limited manpower resources in their ongoing fight against the crime.

**References**

1. These figures are taken from the Annual Reports of the police department of Washington D.C. state from 2008 to 2017. And the number police officers have decreased by 4.6% from 2008 to 2017. The Annual Reports can be found in <https://mpdc.dc.gov/page/mpd-annual-reports>.
2. The 2017 population figure of Washington D.C. state is taken from <https://dc.gov/release/washington-dc-population-closing-700000>, an official press release on 20 December 20017 by Washington D.C. Mayor Muriel Bowser.