**Business Problem**

Cities and towns across the world have some type of crime that is reported every year. Many bigger cities, such as Phoenix, Arizona, have a lot of violent and non-violent crime in different parts of the city. Various dams that were built in Arizona in the early to mid-1900s, paved the way for Phoenix to become the capitol of Arizona in 1912. These dams provided power to different areas of the state. During the second World War, Phoenix started becoming an economic hub for local residents and migrants. In the 1960s and 70s, there started to be several problems when Phoenix started growing a lot. For instance, street gangs turned certain parts of Phoenix into areas where you did not want to go due to crime (i.e. South Phoenix and near downtown area).

Fast forwards to the 1990s and beyond, Phoenix/metro area was becoming and still is a popular city for relocation of individuals and families. Many bars, restaurants, and shops were/are opening up and/or relocating to the area. This helped with Phoenix and the surrounding suburbs revitalization, economic, and housing boom. In 2018, the estimated population of Phoenix was 1.66 million people, the median age was 33.5, and poverty rate was estimated to be at 19.4% (Data USA, 2021). Also in 2018, the median household income was $57,957 and the median property value was $249,100 (Data USA, 2021).

In 2021, Arizona violent and property crimes have dropped. “Violent crime incidents dipped from 4.7 per 1,000 people to 4.6, and property crime fell from 26.8 incidents per 1,000 to 24.4 (Edwards, 2021). Compared to all of the 50 states, Arizona has the fourteenth highest property crime rate and the tenth highest violent crime rate (Edwards, 2021). Phoenix ranked the thirty-second safest city in Arizona.

**Hypothesis**

Phoenix, Arizona has various areas where crime is high. This could be due to a number of factors within each ZIP code such as areas where there are older dilapidated areas, gangs are higher in certain areas, low-income housing, amount of rental units, and high poverty rates.

**Data Used**

The dataset that is used in this evaluation is from 2015 through 2021 Phoenix Crime Data. This data is from the City of Phoenix Open Data website. The data that appears in the dataset include INC\_NUMBER, OCCURRED\_ON (date and time the crime occurred on), OCCURRED\_TO (date and time the crime lasted), UCR\_CRIME\_CATEGORY (main crime category), ONEHUNDRED\_BLOCK\_ADDR (area where the crime occurred), ZIP, and PREMISE\_TYPE (area where the crime occurred) (Appendix A). There are 351,542 records in the Crime Data dataset.

**Methods**

The method that was used in the evaluation of the Phoenix Crime Data dataset is exploratory data analysis (EDA). “Exploratory Data Analysis refers to the critical process of performing initial investigations on data so as to discover patterns, to spot anomalies, to test hypothesis and to check assumptions with the help of summary statistics and graphical representations” (Patil, 2018).

Once the data was imported into Python, the data types, fields, and null values were evaluated. The INC\_NUMBER, OCCURRED\_TO, and ONEHUNDRED\_BLOCK\_ADDR fields were removed as they were not needed. Any null values in the other fields were removed and any zeros in the ZIP field were removed. The year, month, hour, and dayofweek fields were created based on the OCCURRED\_ON field. This date data helps with analyzing the various pieces of information. Only 2016 through 2020 data was used in the datasets as those were the only full years that were available. Different fields were looked at to see if there was any correlations. For instance, the highest number of crimes occurred between the hours of midnight and 12:59 am.

Chart, bar chart, histogram

Description automatically generated

Also, there was not very many differences between the amount of crime reported that occurred between 2016 and 2020 in Phoenix. The data mostly hovered between about 63,000 and 68,000 with 2018 being the highest amount of Phoenix crimes reported.

Based on the number of crimes committed, 85015, 85008, 85009, 85041, and 85051 had the highest crimes in Phoenix.

Chart, histogram

Description automatically generated

Larceny/Theft was by far the highest amount of crime that was committed in the Phoenix area.

Chart, bar chart

Description automatically generated

While reviewing the data further by ZIP Code, it was found that it did not matter whether the data was looked at overall or by year. The same ZIP codes were appearing at the top. Once the top 10 ZIP Codes with the highest number of crimes reported for each year were found (Appendix B), various demographics were reviewed for the top 5 ZIP Codes.

**Conclusion**

In conclusion, the top 5 ZIP Codes that were found to have the highest crime rates (highest to lowest) in Phoenix are 85009 (located approximately between 19th Ave to 43rd Ave and Thomas Rd to Broadway Ave), 85041 (located approximately between Central Ave to 43rd Ave and Broadway Ave to the South Mountain), 85051 (located approximately between I-17 to 43rd Ave and Peoria Ave to Glendale Ave), 85008 (located approximately between 24th St to 64th St and Thomas Ave and Van Buren), and 85015 (located approximately between I-17 to 15th Ave and Glendale Ave to Thomas Ave). The highest Crime Category was Larceny/Theft which is a non-violent crime. The top 5 areas where the most crime occurred (Premise Type) include single family houses, apartment, parking lot, street/roadway/alley/sidewalk, and retail business.

Demographics

**85009 (#5)**

* 13.9K Total Residential Units
* 39% Rental Residential
* Median Age of Homes: 67 years
* Male: 28.058\*
* Female: 23,653\*
* Hispanic: 42,235\*
* White: 6,171\*
* Black: 1,734\*
* Native American: 799\*
* Asian: 162\*
* Pacific Islander: 111\*
* Other: 109\*
* Two or More Races: 390\*
* < 9th Grade: 7,819\*
* 9th to 12th Grade (No Diploma): 4,704\*
* HS Graduate or Equivalent: 9,283\*
* Some College: 4,738\*
* Associates Degree: 1,153\*
* Bachelor’s Degree: 1,367\*
* Graduate or Professional Degree: 538\*
* Median Household Income: 32,893\*
* Below Poverty Level: 16,469\*
* Below 150% Poverty Level: 24,358\*
* Below 200% Poverty Level: 31,977\*
* Total Square Miles: 15.6\*

**85041 (#4)**

* 19K Total Residential Units
* 26% Rental Residential
* Median Age of Homes: 17 years
* Male: 30,073\*
* Female: 32,079\*
* Hispanic: 39,976\*
* Non-Hispanic:9,323\*
* Black: 8,829\*
* Native American: 934\*
* Asian: 1,660\*
* Pacific Islander: 46\*
* Other: 12\*
* Two or More Races: 1,372\*
* < 9th Grade: 5,652\*
* 9th to 12th Grade (No Diploma): 4,484\*
* HS Graduate or Equivalent: 10,069\*
* Some College: 7,624\*
* Associates Degree: 2,511\*
* Bachelor’s Degree: 3,992\*
* Graduate or Professional Degree: 2,235\*
* Median Household Income: 54,546\*
* Below Poverty Level: 13,644\*
* Below 150% Poverty Level: 21,448\*
* Below 200% Poverty Level: 29,573\*
* Total Square Miles: 15.9\*

**85051 (#3)**

* 16.1K Total Residential Units
* 41% Rental Residential
* Median Age of Homes: 54 years
* Male: 22,645\*
* Female: 22,668\*
* Hispanic: 20,874\*
* Non-Hispanic:17,123\*
* Black: 3,576\*
* Native American: 895\*
* Asian: 1,848\*
* Pacific Islander: 5\*
* Other: 25\*
* Two or More Races: 967\*
* < 9th Grade: 2,721\*
* 9th to 12th Grade (No Diploma): 3,207\*
* HS Graduate or Equivalent: 8,637\*
* Some College: 6,799\*
* Associates Degree: 2,619\*
* Bachelor’s Degree: 3,233\*
* Graduate or Professional Degree: 1,222\*
* Median Household Income: 43,942\*
* Below Poverty Level: 12,566\*
* Below 150% Poverty Level: 17,036\*
* Below 200% Poverty Level: 22,946\*
* Total Square Miles: 6.4\*

**85008 (#2)**

* 24K Total Residential Units
* 58% Rental Residential
* Median Age of Homes: 67 years
* Male: 31,647\*
* Female: 30,693\*
* Hispanic: 34,818\*
* Non-Hispanic:12,649\*
* Black: 7,539\*
* Native American: 1,782\*
* Asian: 629\*
* Pacific Islander: 50\*
* Other: 55\*
* Two or More Races: 1,142\*
* < 9th Grade: 4,610\*
* 9th to 12th Grade (No Diploma): 5,116\*
* HS Graduate or Equivalent: 9,922\*
* Some College: 8,832\*
* Associates Degree: 2,419\*
* Bachelor’s Degree: 5,464\*
* Graduate or Professional Degree: 2,209\*
* Median Household Income: 43,574\*
* Below Poverty Level: 14,866\*
* Below 150% Poverty Level: 22,758\*
* Below 200% Poverty Level: 32,739\*
* Total Square Miles: 10.5\*

**85015 (#1)**

* 17.3K Total Residential Units
* 52% Rental Residential
* Median Age of Homes: 68 years
* Male: 20,728\*
* Female: 21,167\*
* Hispanic: 18,682\*
* Non-Hispanic:12,649\*
* Black: 5,872\*
* Native American: 1,041\*
* Asian: 2,051\*
* Pacific Islander: 52\*
* Other: 30\*
* Two or More Races: 1,518\*
* < 9th Grade: 3,347\*
* 9th to 12th Grade (No Diploma): 2,727\*
* HS Graduate or Equivalent: 6,973\*
* Some College: 5,459\*
* Associates Degree: 2,122\*
* Bachelor’s Degree: 3,045\*
* Graduate or Professional Degree: 1,856\*
* Median Household Income: 38,019\*
* Below Poverty Level: 12,785\*
* Below 150% Poverty Level: 18,877\*
* Below 200% Poverty Level: 24,945\*
* Total Square Miles: 4.9\*

\* Data is from the 2019 American Community Survey which is part of the Census

Bureau. This survey collects and produces data on economic, social, housing, and

demographic data every year. The Census Bureau contacts, through mail, contacts 3.5

million households to participate in the survey every year. Once they collect the data,

the Census Bureau uses calculations to estimate the data.

**Next Steps**

Since this is only exploratory data analysis (EDA), there will be a future project that goes even further into analyzing the data utilizing various statistical techniques and predicting future crime rate and/or types of crimes that could happen in the various ZIP Codes. Also, the demographics would need to be analyzed more.

**Appendix**

**Appendix A**

|  |
| --- |
| **UCR\_CRIME\_CATEGORY** |
| AGGRAVATED ASSAULT |
| ARSON |
| BURGLARY |
| DRUG OFFENSE |
| LARCENY-THEFT |
| MOTOR VEHICLE THEFT |
| MURDER AND NON-NEGLIGENT MANSLAUGHTER |
| RAPE |
| ROBBERY |

|  |  |  |
| --- | --- | --- |
| **PREMISE\_TYPE** | **PREMISE\_TYPE** | **PREMISE\_TYPE** |
| ABANDONED/CONDEMNED STRUCTURE | FARM FACILITY | PARK / PLAYGROUND |
| ADULT ONLY STORE / MOVIE | FAST FOOD STORE | PARK AND RIDE |
| AIRPORT | FENCED COMMERCIAL YARD | PARKING GARAGE |
| ALLEY | FENCED RESIDENTIAL YARD | PARKING LOT |
| AMUSEMENT PARK | FIELD/WOODS | RAIL STATION |
| APARTMENT | FOJ - PREMISE UNKNOWN | RAIL STOP |
| ARENA / STADIUM / CONVENTION CENTER | GAMBLING FACILITY/CASINO/RACE TRACK | RENTAL STORAGE / FACILITY |
| ATM SEPARATE FROM BANK | GARAGE | REST AREA |
| AUTO DEALERSHIP NEW/USED | GARAGE / CARPORT | RESTAURANT |
| BANK / SAVINGS / CREDIT UNION | GAS / SERVICE STATION | RETAIL BUSINESS |
| BAR / LOUNG / NIGHT CLUB | GOVERNMENT / PUBLIC BUILDING | RIVER BOTTOM |
| BUS | GROCERY / SUPER MARKET | SCHOOL-COLLEGE/UNIVERSITY |
| BUS / LIGHT RAIL | GROUP HOME | SCHOOL-ELEMENTARY/SECONDARY |
| BUS / RAIL STATION | HOSPITAL | SCHOOL-OTHER |
| BUS FACILITY | HOSPITIAL / NURSING CARE | SCHOOL/COLLEGE/CHILD CARE |
| BUS STATION | HOTEL / MOTEL | SHELTER-MISSION/HOMELESS |
| BUS STOP | INDUSTRIAL SITE | SHOPPING MALL |
| CAMP/CAMPGROUND | JAIL / PRISON / PENITENTIARY | SINGLE FAMILY HOUSE |
| CANAL / RIGHT-OF-WAY | LAKE / WATERWAY / BEACH | SINGLE FAMILY HOUSING |
| CARPORT | LIGHT RAIL | SINGLE FAMILY HOUSING} |
| CHILD CARE / DAY CARE | LIGHT RAIL FACILITY | SPECIALTY STORE |
| CHURCH / SYNAGOGUE / TEMPLE / MOSQUE | LIGHT RAIL PLATFORM | STOREROOM / SHED |
| COMMUNITY CENTER | LIGHT RAIL TRAIN | STOREROOM/SHED (COMMERCIAL) |
| CONDO / TOWNHOUSE | LIQUOR STORE | STOREROOM/SHED (RESIDENTIAL) |
| CONSTRUCTION SITE | LOAN / FINANCE COMPANY | STREET / ROADWAY / ALLEY / SIDEWALK |
| CONVENIENCE MARKET / STORE | MEDICAL OFFICE | STREET / ROADWAY / ALLEY SIDEWALK |
| CYBERSPACE | MILITARY INSTALLATION | STREET / ROADWAY / SIDEWALK |
| DEPARTMENT / DISCOUNT STORE | MOBILE HOME | THEATRE |
| DOCK/WHARF/FREIGHT/MODAL TERMINAL | MOUNTAIN AREA | TRAIN STATION |
| DRIVE-IN MOVIE | NURSING CARE | TRIBAL LANDS |
| DRIVEWAY | OFFICE / COMMERCIAL BUILDING | UNKNOWN |
| DRUG STORE | OPEN SPACE / DESERT | VEHICLE |
| EASEMENT | OTHER | WAREHOUSE / FACTORY |

**Appendix B**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **ZIP Code** | **# of Crimes** |  | **Year** | **ZIP Code** | **# of Crimes** |  | **Year** | **ZIP Code** | **# of Crimes** |  | **Year** | **ZIP Code** | **# of Crimes** |  | **Year** | **ZIP Code** | **# of Crimes** |
| 2016 | 85032 | 2018 |  | 2017 | 85032 | 2184 |  | 2018 | 85033 | 2150 |  | 2019 | 85033 | 2150 |  | 2020 | 85023 | 2092 |
| 2016 | 85033 | 2031 |  | 2017 | 85021 | 2217 |  | 2018 | 85043 | 2266 |  | 2019 | 85043 | 2266 |  | 2020 | 85021 | 2142 |
| 2016 | 85021 | 2035 |  | 2017 | 85043 | 2317 |  | 2018 | 85021 | 2377 |  | 2019 | 85021 | 2377 |  | 2020 | 85017 | 2533 |
| 2016 | 85035 | 2164 |  | 2017 | 85035 | 2469 |  | 2018 | 85035 | 2379 |  | 2019 | 85035 | 2379 |  | 2020 | 85035 | 2654 |
| 2016 | 85017 | 2512 |  | 2017 | 85051 | 2646 |  | 2018 | 85017 | 2558 |  | 2019 | 85017 | 2558 |  | 2020 | 85043 | 2715 |
| 2016 | 85009 | 2554 |  | 2017 | 85017 | 2713 |  | 2018 | 85041 | 2758 |  | 2019 | 85041 | 2758 |  | 2020 | 85041 | 2929 |
| 2016 | 85041 | 2590 |  | 2017 | 85041 | 2795 |  | 2018 | 85051 | 2799 |  | 2019 | 85051 | 2799 |  | 2020 | 85009 | 3118 |
| 2016 | 85051 | 2661 |  | 2017 | 85009 | 2839 |  | 2018 | 85008 | 2942 |  | 2019 | 85008 | 2942 |  | 2020 | 85015 | 3206 |
| 2016 | 85008 | 3034 |  | 2017 | 85008 | 3304 |  | 2018 | 85009 | 2980 |  | 2019 | 85009 | 2980 |  | 2020 | 85008 | 3212 |
| 2016 | 85015 | 3448 |  | 2017 | 85015 | 3308 |  | 2018 | 85015 | 3374 |  | 2019 | 85015 | 3374 |  | 2020 | 85051 | 3278 |

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