

Salt Lake County Arrests Data Analysis and Visualization

The data used for this analysis is from www.data.gov. The data was initially extracted on 4/4/2016. The underlying data are from the FBI's Uniform Crime Reporting (UCR) Program. The Bureau of Justice Statistics (BJS) has expanded upon the FBI's estimates to provide national arrest estimates detailed by offense, sex, age, and race. The method of data collection is described on the BJS website as follows;

The FBI annually collects arrest counts from a large number of law enforcement agencies through its Uniform Crime Reporting Program (UCR). These arrest statistics are reported voluntarily, and the FBI accepts data from all agencies willing to report. The FBI will accept data from agencies through the end of the following year; for example, the window for receiving 2009 arrest data remained open until the end of 2010. Each year some law enforcement agencies report complete 12-month data, while other agencies are partial reporters (i.e., reporting arrests for less than 12 months) or do not report at all. Data used in this tool are from agencies that reported for the complete 12-month period in that year. The number of agencies that reported 12-month complete data varied from year to year (table 1). Since 1980, the law enforcement agencies that submitted complete 12-month arrest data have had jurisdiction over about 80% of the U.S. resident population. The agency-level data in this tool reflect annual counts from 12-month reporting agencies only; no arrest counts are presented for partial reporting agencies¹.

In the 2012 calendar year the data came from 12,339 agencies nationwide, covering over 80% of the U.S. population. The data covers two age groups, juvenile and adult, and while this may be a short coming since ideally we would like to see an actual age bracket breakdown, for the purpose of a simple analysis this breakdown will suffice. The BJS acknowledges that there may be some inaccuracies in the data given the magnitude of work involved in collecting and reporting the data. The data used in the analysis of arrests in Salt Lake County is only from agencies within the county who reported data from 2000 to 2012. The list of law enforcement agencies available in the dataset are as follows;

- Salt Lake County Sheriff's Office*
- Taylorsville Police Department*
- Midvale Police Department*
- Draper Police Department*
- Cottonwood Heights Police Department*
- West Valley City Police Department
- Salt Lake City Police Department
- West Jordan Police Department
- Sandy Police Department
- South Jordan Police Department
- South Salt Lake Police Department

The agencies denoted with an asterisk (*) do not have complete data for the 13 year period from 2000 to 2012 and were not used in this analysis. Therefore the data analysis only contains data from six agencies; West Valley City Police Department, Salt Lake City Police Department, West Jordan Police Department, Sandy Police Department, South Jordan Police Department and South Salt Lake Police Department.

The format of the data is in a tabular form with a column specifying the offense which can be anything from murder, larceny-theft, to vandalism, etc. In total 31 offenses are listed but some are sub-categories of others. For example Drug Abuse Violations is broken down by Drug Sale or Manufacturing and Drug Possession. The data also includes to indices, Violent Crime and Property Crime. The Violent Crime Index

¹ <http://www.bjs.gov/index.cfm?ty=datool&surl=/arrests/index.cfm#> Extracted on: 4/6/2016

includes the offenses of murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault. Property crime index includes offenses of burglary, larceny-theft, motor vehicle theft, and arson. Other columns specify counts for total offenses broken down by race. Two other set of columns specify juvenile offenses and adult offenses broken down by race as well. One short coming of the dataset is that it does not identify Hispanic or Latino as a race. It only includes data for White, Black, American Indian or Alaskan Indian and Asian or Pacific Islander offenders. The data was downloaded to an excel spread sheet one agency at the time, one year at the time.

Data scrubbing included formatting the data into the ideal tabular form which tableau can perform more effective queries. Offenses that did not have meaningful data like Arson, Fraud and Embezzlement were discarded. Furthermore some offenses were under reported, these too were discarded. Some of the data included a negative one which was an indication of no data reported. All negative values were turned into zeroes. Only meaningful offenses were kept. The data was compiled into one master file with year, agency and city. This is the primary file used for analysis. The file contains a little over 1400 rows consisting of agency, year, and offense. The attribute city was added for the purposes of geo-locating where the offenses occurred in the Salt Lake County area.

Some interesting insights were extracted from the data. First, the majority of arrests in Salt Lake County are conducted by the Salt Lake City Police Department with 10,561 arrests in 2012 followed by the West Valley City Police Department with 5,627 arrests in the same year. The agency with the least activity is South Salt Lake Police Department with 306 arrests in 2012 (Figure 16: Salt Lake County-Arrests by Agency). The tree map visualization on Figure 17: Salt Lake County-Offense Statistics show an overall picture of offenses in Salt Lake County by year. In detail the tree map shows the total arrests per offense as well as the breakdown of juvenile and adult arrests. For example in 2012 Larceny-Theft was by far the largest portion of arrest most of which were adults. Overall juvenile arrests don't account for a significant proportion except for Runway offensives with 100% of arrests being juveniles. Juvenile arrests account for 26% of all arrests in 2012. Surprisingly, the offense with the highest proportion of juveniles is Motor Vehicle theft at 39% in 2012. That percent may not be surprising but that it is on Motor Vehicle Theft as convention would lead one to believe that Motor Vehicle Theft would not share that high of a rate with juvenile arrests.

These discoveries lead to further analysis on juvenile arrests. A look at juvenile arrests overtime shows that juvenile arrest for minority groups, which includes Blacks, American Indian and Native Alaskan and Asians and Pacific Islanders, do not trend in the same manner that total or juvenile White arrests does (Figure 18: Salt Lake County-Juvenile vs Adult Arrests Overtime). The trend for juvenile arrests over the 13 year period is very flat. In fact adult minority arrest follow as similar trend. Conversely, arrests for juvenile and adults Whites follow a hectic trend going up and down year over year. This trend mirrors the total arrests trend which makes sense since White arrests accounted for 85% of arrests. Since it shares a significant proportion white arrests dictate the trend.

There are a couple of interesting patterns emerging. One big question is why there is a spike in arrests in 2008 followed by a sharp decrease. Two is why juvenile arrests in a decline for Whites but increasing slightly for minority juveniles. These two patterns are worthy of deeper analysis. Moreover, for the purposes of this analysis, we will focus our analysis efforts on the first question.

Overall the trend in the number of arrests overtime is increasing as depicted by Figure 19: Salt Lake County Arrests Overtime. But that huge hump in 2008 cannot be ignored. The first thing that comes to mind, which may affect the number of arrests, is the 2008 economic recession or what is known as the Great Recession; "a period of economic decline observed in world markets beginning around the end²" of

² The Great Recession – Wikipedia.com (https://en.wikipedia.org/wiki/Great_Recession) Accessed on 4/6/2016.

2007. Analysts suggest that the Great Recession extended over 19 months ending around mid-2009. The recession is an easy scapegoat for the increase in arrests but the decline in arrests in 2009 and subsequently in 2010 cannot be explained away that easily.

To put things into perspective data from the website opendata.utah.gov was downloaded. These data included population changes and unemployment in Salt Lake County in a 13 year period from 2000 to 2012. A visualization of these data along with our Arrests data was built to show any correlations that may exist (Figure 20: Salt Lake County-Arrests, Population and Unemployment). We can see from this visualization that the recession may have also affected net migration which shows a dip to negative numbers that remains until 2009 and stays very close to 0 over the next three years. Similarly, the number of unemployed workers dips as we get closer to 2007 but spiked violently in 2008 and only begins to decline in 2010 and has yet to recover to pre-recession levels as of 2012. Things are beginning to make a bit more sense. The high number of unemployed people in the 2008 recession may have contributed to an increasing number of arrests.

Not so fast, however, if that was the case we would have seen a reverse pattern in beginning in 2004 and ending right before the recession (2007) as the number of unemployed dipped to historic low numbers. Conclusively, we have no definitive explanation for the sharp decline in the number of arrests. A likely explanation may be in the changing distribution of law enforcement agencies in the county. As the data was being extracted from the BJS website one noticeable absent agency was the Unified Police Department of Greater Salt Lake. In 2009 the county's sheriff's office was transformed into a "law enforcement cooperative that will provide police services to unincorporated areas of the county as well as the cities of Holladay, Herriman, and Riverton"³. The UPD began to incorporate areas in 2009. While the employment population factors discussed above, the absence of that UPD data from the BJS may be the most reasonable explanation for the decline in arrests. Lastly, the data from UPD, if it were to be made available, may have a significant impact on the observation that juvenile arrests show a decline for Whites but conversely an increase for minority groups (Figure 21: Salt Lake County-Juvenile Arrests).

Tableau is gaining a lot of traction and popularity and I think it can be attributed to the ease of use. Also being able to connect to a variety of data sources offers a lot flexibility to many organizations who may have a verity of source systems like Point of Sale systems, Customer Management System, Web Analytics, etc. I feel like I learned a lot in this training and I am looking forward to doing more hands one work with Tableau. Despite having spent a huge amount of time in this project I feel like I have only scratched the surface because it seems like Tableau has more to offer.

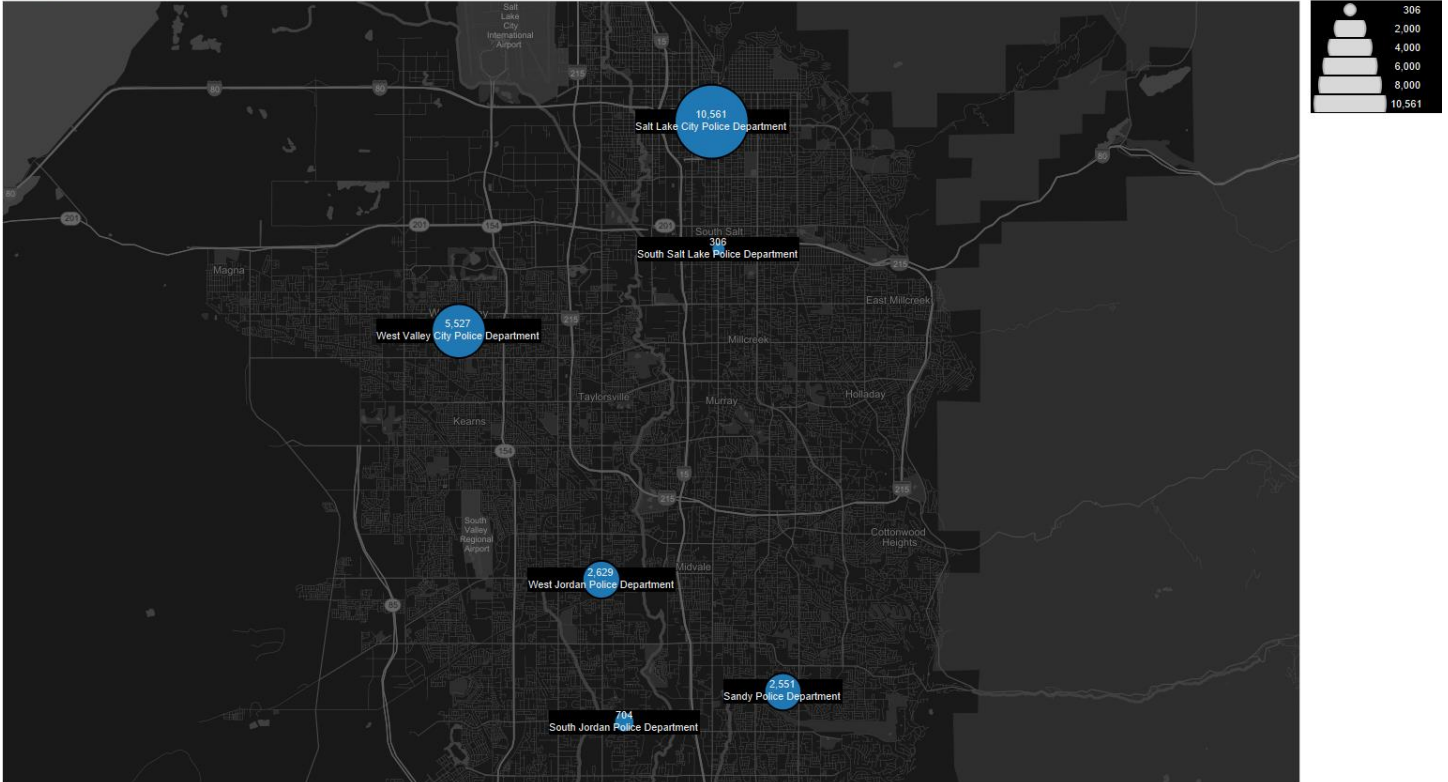
For a detailed look into the data in Tableau check out the workbook Arrests-Race-Agency. The story within the workbook shows a progression of this analysis. The workbook is also available on Tableau Public at: https://public.tableau.com/views/Arrests-Race-Agency/WhatBehindArrests?:embed=y&:display_count=yes&:showTabs=y

³ Unified Police Department – ksl.com editorial (<http://www.ksl.com/?nid=238&sid=9155228>) Accessed on 4/6/2016

Screenshots

Figure 16: Salt Lake County- Arrests by Agency

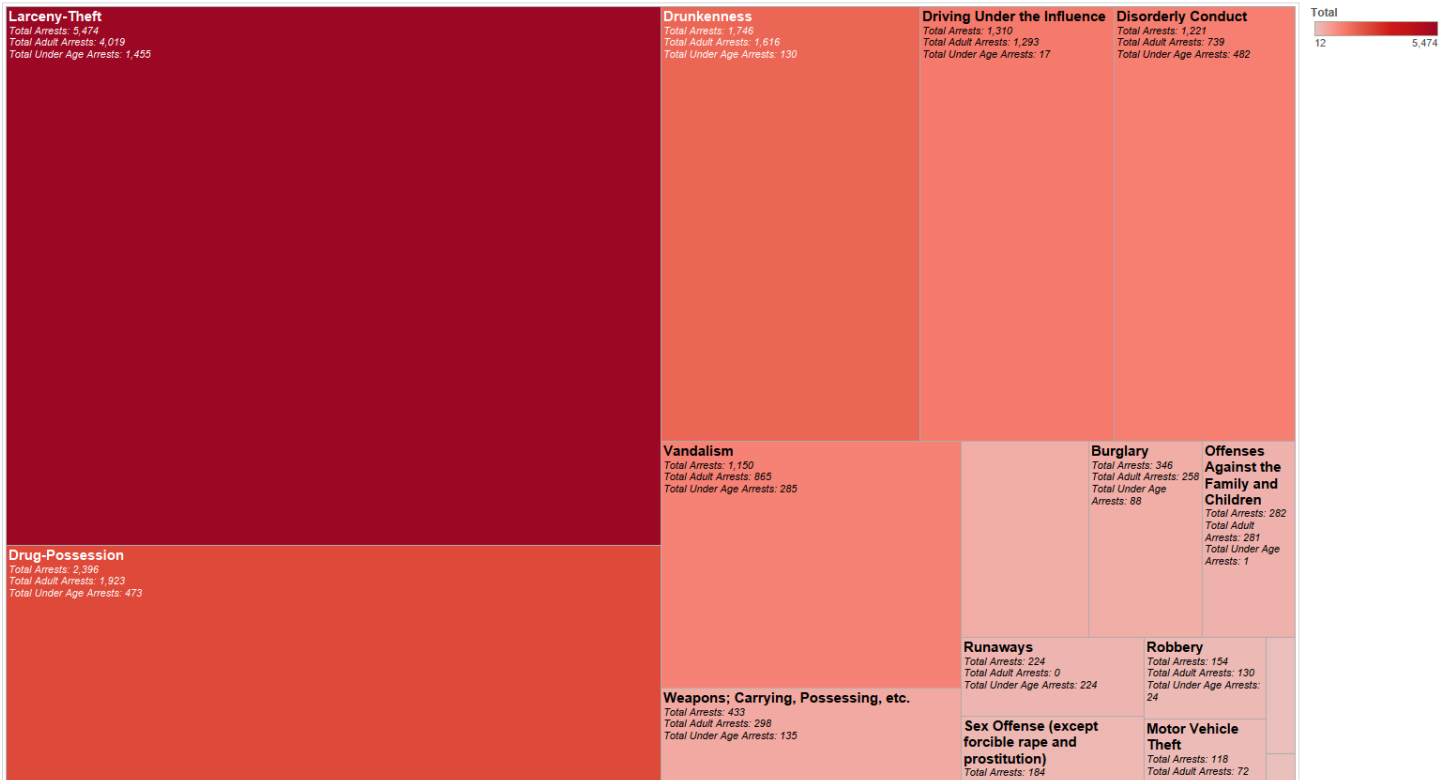
County Crime



Map based on Longitude (generated) and Latitude (generated). Size shows sum of Total. The marks are labeled by sum of Total without Negatives and Agency. Details are shown for City, State. The data is filtered on Year, which keeps 2012.

Figure 17: Salt Lake County-Offense Statistics

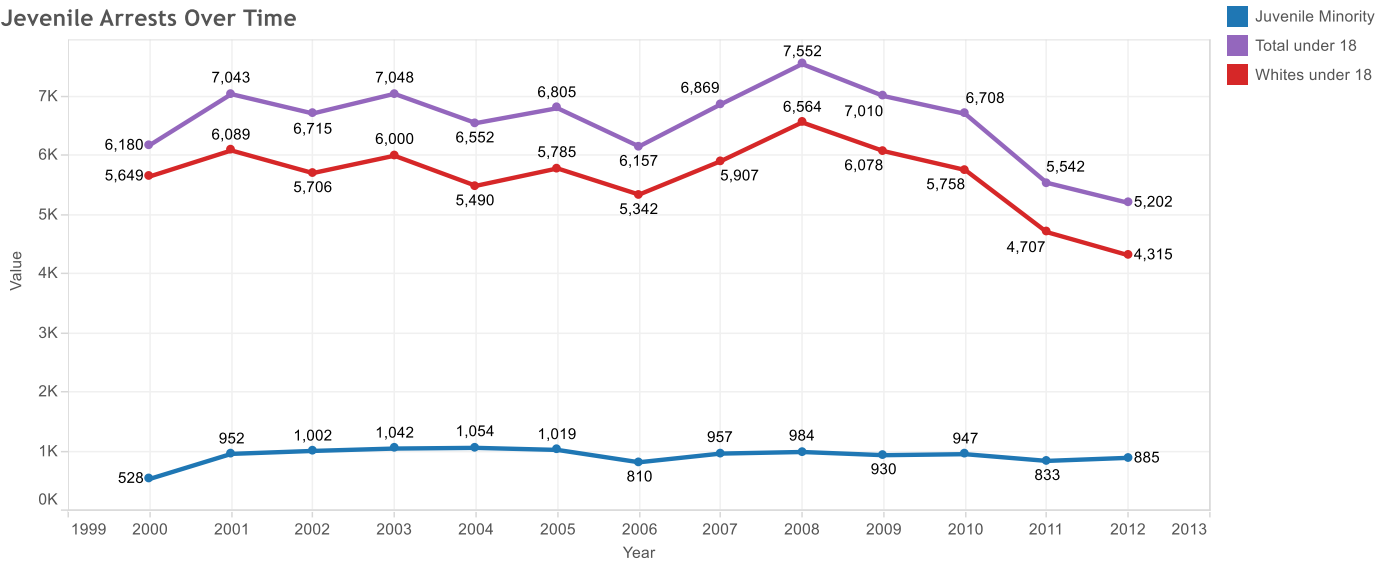
Offenses



Sum of Total, Offense, sum of Total over 18 and sum of Total under 18. Color shows sum of Total. Size shows sum of Total. The marks are labeled by sum of Total, Offense, sum of Total over 18 and sum of Total under 18. The data is filtered on Year, which keeps 2012. The view is filtered on Offense, which excludes Property Crime Index and Violent Crime Index.

Figure 18: Salt Lake County-Juvenile vs Adult Arrests Overtime

Juvenile Arrests Over Time



Adult Arrest Over Time

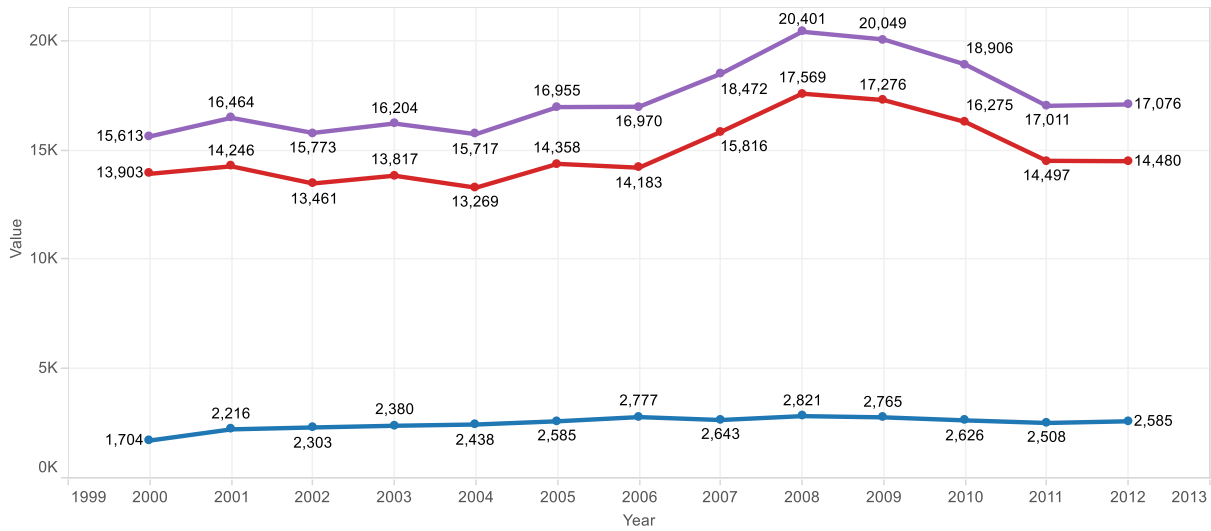
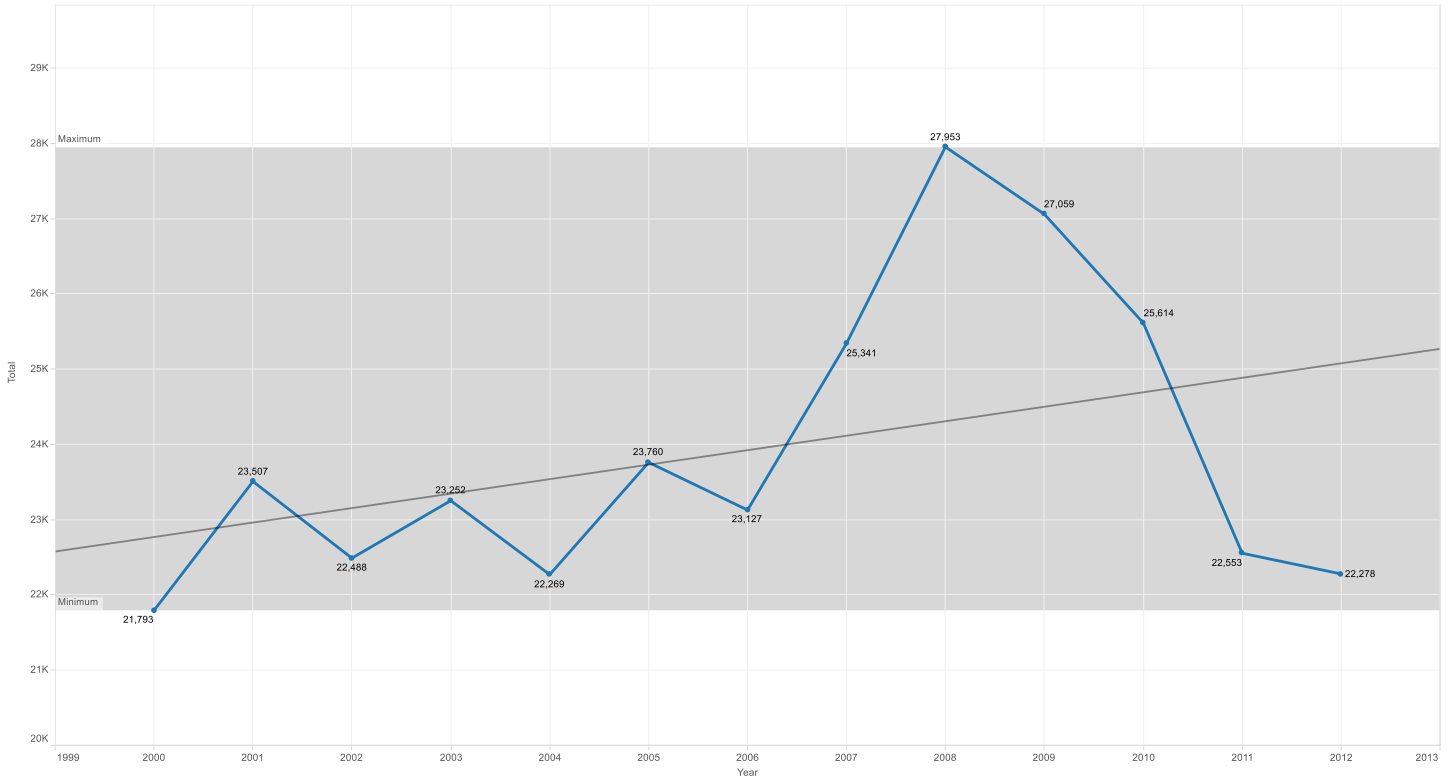


Figure 19: Salt Lake County-Arrests Overtime

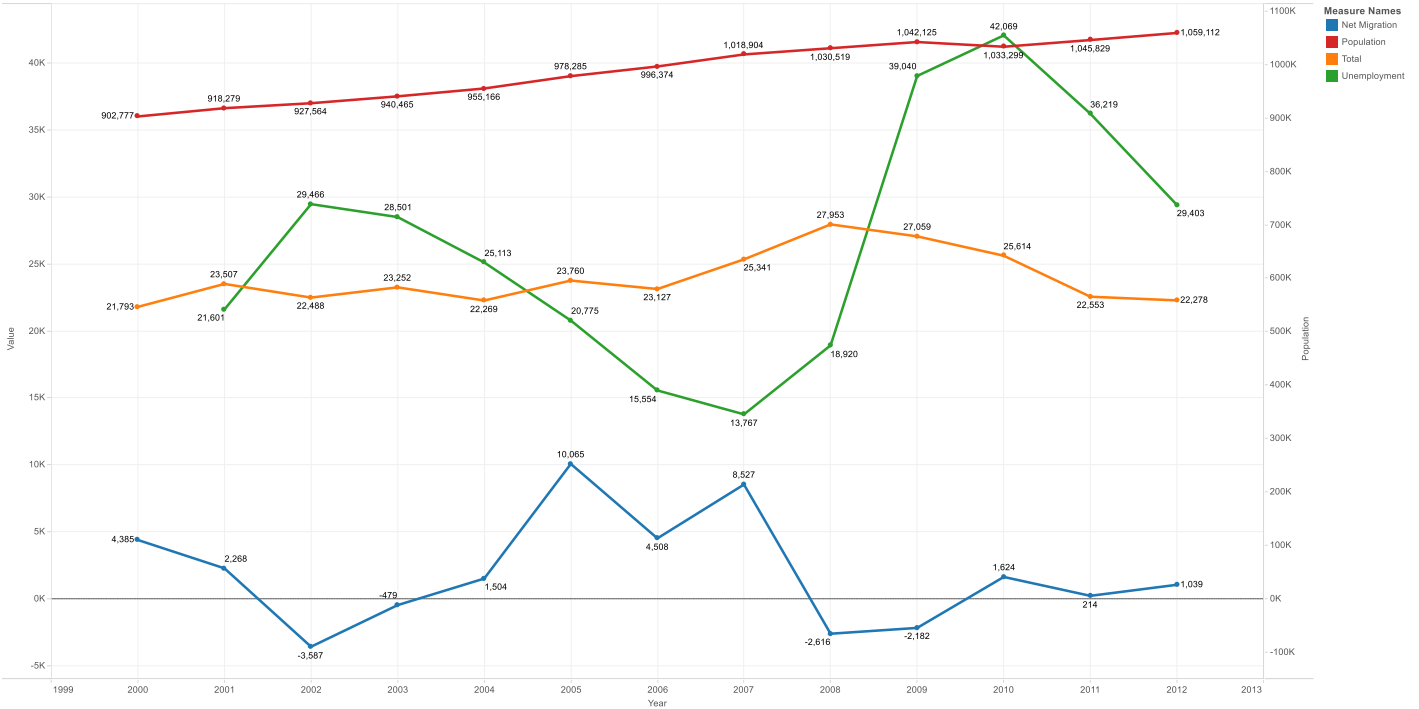
Arrests Over Time



The trend of sum of Total for Year. The marks are labeled by sum of Total.

Figure 10: Salt Lake County-Arrests, Population and Unemployment

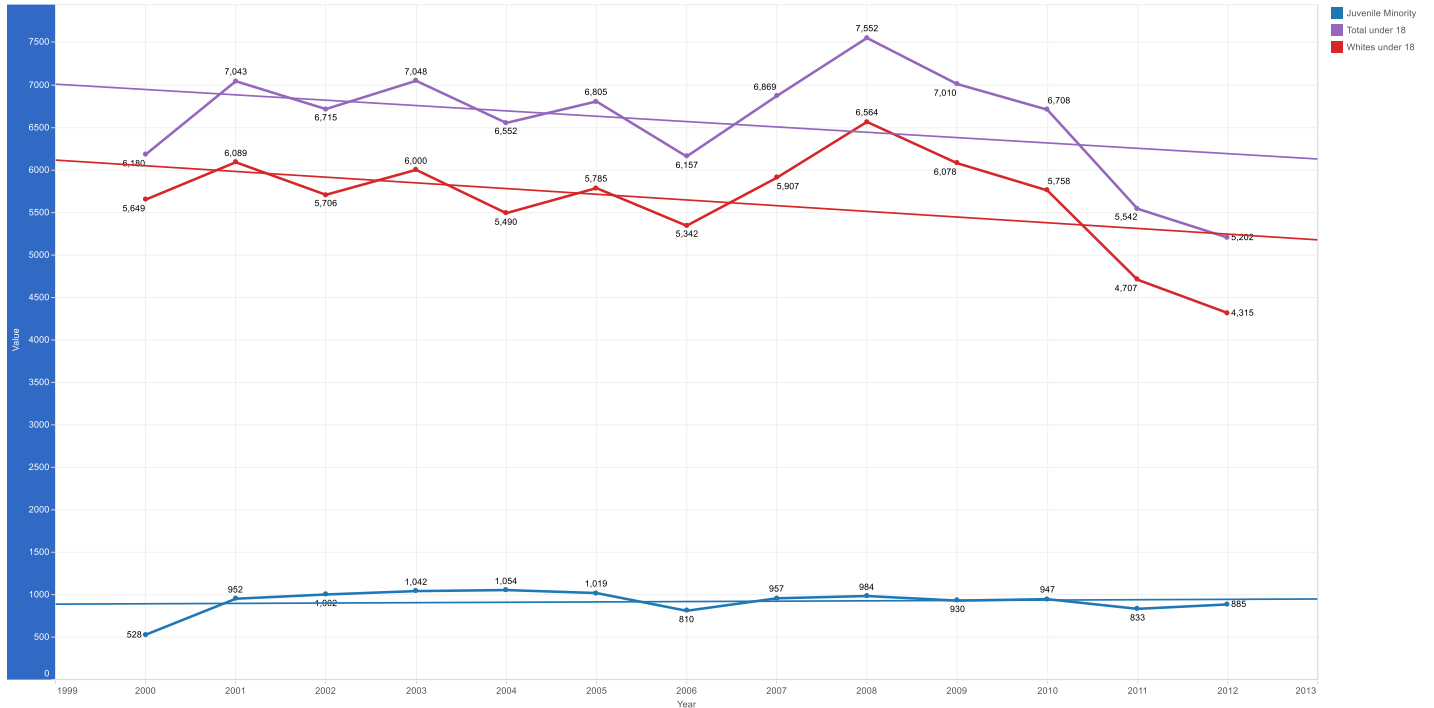
Arrest, Populatoin, Employemet



The trends of Net Migration, Total, Unemployment, Population and Population for Year. Color shows details about Net Migration, Total, Unemployment and Population.

Figure 21: Salt Lake County-Juvenile Arrests

Juvenile Arrests Over Time



The trends of Juvenile Minority, Total under 18 and Whites under 18 for Year. Color shows details about Juvenile Minority, Total under 18 and Whites under 18.