

# Juvenile Arrest Rate Investigation in California

Haojun Chen Cong Wang Jin Wang Zihao Peng

The Hong Kong University of Science and Technology

## 1 ABSTRACT

Data can be a powerful tool to improve the health and well being of children, families, and communities. It can be used to assess needs, set priorities, develop action plans, inform programs and policies, track progress, support grant proposals, strengthen advocacy efforts, raise awareness of key issues, and more. Research on data visualisation is undergoing major developments in a number of different fields. These developments include investigating ways of applying visualisation techniques and systems for more efficient manipulation, interpretation and presentation of data. In the built environment field, the potential of new visualisation technologies to enhance the presentation of performance data obtained as output from simulation programmes has remained almost unexplored. We use the data from some government and Non-Government-Organization websites. The primary aim of the work summarised here was to commence the development of a method for visualising the data produced by Tableau. We want to provides some examples of how to process, analyse and visualize criminal justice data.

Index Terms (Keywords): Juvenile, Felony, Crime, Arrest rate, California

## 2 INTRODUCTION

This following report analyzed historical data of juvenile arrests rates in California. It covers 15-year period from 2000 to 2015, based on data from *kidsdata.org*, *Childstats.gov*, *Kids Count Data Center of Annie E. Casey Foundation*, *Uniform Crime Program*, *National Crime Victimization Survey (NCVS) Victimization Analysis Tool* and *the Bureau of Justice Statistics*. The *Kidsdata.org*, for example, provides the support to people who work for the children by allowing them to access the high quality, wide-ranging and local data. This foundation allows user to find, customize and use data on over 600 measures of child health and well-being. The data are obtained from California counties, cities, school districts and legislative districts, and attributes including family income, race/ethnicity, and age. The goal of this project is to find the relationship between the juvenile arrest rate and factors such as the unemployment rate, poverty rate and the rate of abuse & neglect for each county. Also, since the data are often entered by hand, they are prone to error. Plotting the data permits the analyst to determine the extent to which the assumptions are valid and to catch obvious errors in data entry. Moreover, while standard statistical techniques are useful in testing hypotheses, visualization allows the data to tell its story and thus is useful in generating hypotheses. By reviewing trends over the 15 years, readers can develop a detailed understanding of matters entering the criminal justice system in California through arrest. According to The Uniform Crime Program (UCR) of FBI, it collects the arrest data from participating state and local law enforcement agencies. These agencies provide monthly counts of their arrests (including citations and summons) for criminal acts within several offense categories. Especially for the crime in the United States in 2009, the FBI estimated that the state and local law enforcement

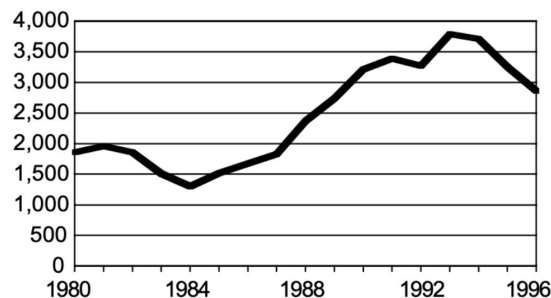
agencies covered by the UCR made 13,687,000 arrests in 2009. Statistics in this report expand the FBI's set of published arrest estimates to include estimates of arrests by age group, sex, and race within many offense categories. These detailed breakdowns of arrests and arrest trends provide a unique understanding of the flow of individuals into the criminal justice system over a long period of time. Within a single offense category, arrest trends often differ substantially for males and females, juveniles and adults, and racial groups. To interpret the arrest statistics presented in the report, readers are encouraged to review the FBI's counting rules discussed in the Methodology. This report uses arrest rates rather than arrest counts to display a 15-year trend because rates control for changes in the size of the reference population over this time period. In addition, readers should review graph legends before studying the graphs because some arrest rates have been multiplied by a constant to make the trends more visible. In the graph legends throughout this report, American Indian/Alaskan Native and Asian/Pacific Islander are categorized under "Others". In addition to this report, BJS has developed an online data access tool that enables users to generate graphs and tables of national trends in arrests and arrest rates for a large set of offenses and population subgroups. The online tool is available on the BJS website. This tool will enable policymakers, justice system professionals, advocates, the media, researchers, students, and the public to produce the specific information they need with little effort, information that is often not readily available or that cannot be found in any other resource.

## 3 RELATED WORK

Various work has been done to analyze the juvenile felony rate. Kevin J.Storm and Steven K.Smith from BJS Statisticians, Howard N.Snyder from National Center for Juvenile Justice [1] investigated Juvenile Felony Defendants in Criminal Courts in USA from 1990-1994. In the Nation's 75 largest counties, juveniles transferred to criminal courts represented about 1% of all felony defendants. Juveniles transferred to criminal court were generally violent felony offenders. Two-thirds were charged with a violent offense, including about 11% with murder, 34% with robbery, and 15% charged with felony assault. 63% of juveniles transferred to criminal courts were black males, 29% were white males, 3% were black females, and 2% were white females. 59% of juveniles transferred to criminal courts were convicted of a felony, and 52% of those convicted of a felony were sentenced to prison. About a third of juveniles in criminal courts sentenced to State prison received a sentence of 4 years or less. The average prison sentence for juveniles convicted in criminal courts was about 9 years; for those convicted of a violent offense, the average prison sentence was nearly 11 years.

Howard N. Snyder found that murder arrests of juvenile has a trend of increasing since 1980s[2].

### Murder arrests of juveniles



Note: Arrest estimates are based on data reported in the series Crime in the United States using an assumption that the annual proportion of juvenile arrests in the reporting sample is the same as in the U.S. population.

Rebecca J. Howell's study addressed whether race has a direct impact on waived juveniles being criminally sentenced to restitution, probation, or jail.[3]

Besides, there is also work on understanding why juvenile are behind the bars in the felony community and family context by Mark Willson.[4]

According to Roscoe and Morton, the racial and ethnic differences in rates of serious juvenile offending have been observed throughout the twentieth century. Black youth are overrepresented in arrests for index crimes reported to the Uniform Crime Reports (Roscoe & Morton, 1994; Snyder & Sickmund, 1995).

However, according to Hawkins, Laub, & Lauristen, the Black-White juvenile arrest ratio for violent crime declined between 1983 and 1992, overrepresentation among Black and Hispanic youth is found in pre-adjudication detention centers and residential placements (Gallagher, 1999; Roscoe & Morton, 1994).

According to the statistics from Attorney General Bercera Releases 2017, the juvenile arrest rate Juvenile Justice in California 2017 provides insight into the juvenile justice process by reporting the number of arrests, referrals to probation departments, petitions filed, and dispositions for juveniles tried in juvenile and adult courts.

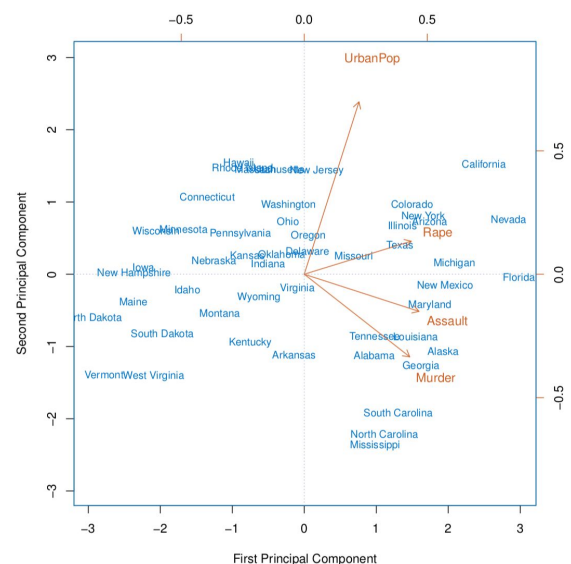
There is evidence that ambient PM2.5 may increase delinquent behavior before and during adolescence amongst urban-dwelling 9–18 year olds. These bad effects may be aggravated by unfavorable parent-child relationships and parental psychosocial distress. Future studies are needed to investigate whether PM2.5 may affect early-life trajectories of externalizing behaviors. If the adverse neurobehavioral effects of PM2.5 are substantiated, the resulting knowledge may shed new light on interventions for adolescent delinquency and offer additional impetus to strengthen regulatory standards [8].

It is also believed that the rate of child abuse and neglect also account for the arrest rate: According to "Allegations of maltreatment and delinquency: Does risk of juvenile arrest vary substantiation status?", more than 3.5 million children in the United States were reported and received an investigation or assessment for abuse or neglect and an estimated 794,000 (23%) of these investigations were substantiated (U.S. Department of Health & Human Services, 2009). In terms of age, 32% of all allegations were under four years old; 24% were 4–7 years old and 19% were 8–11 years old; and 25% were 12 years and older. Regarding gender, males comprise 48% of allegation referrals. In terms of race and ethnicity, nearly half of all children were White (46%), one-fifth were African American (22%), and one-fifth were Hispanic (21%). The majority of the children were involved in neglect cases (59%), followed by multiple forms of maltreatment (13%), physical abuse (11%), and sexual abuse (8%) (U.S. Department of Health & Human Services, 2009).

## 4 TASK AND REQUIREMENT ANALYSIS

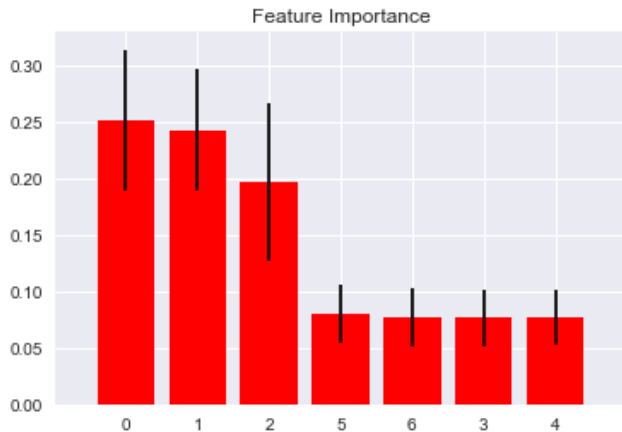
We analyzed the factors of juvenile arrest rate from various aspect such as school, family and society. And we will use Tableau, R and Python to visualize the relationship between them. The reason Why we use Tableau is that it is a data visualization tool that is able to support complex computations, data blending and dashboarding to create aesthetic visualizations that convey insights that cannot easily be derived from the simple spreadsheet. We can quickly create interactive visualizations by using the drag-n-drop functionalities of Tableau. The interface is able to deal with many variations while preventing you from creating charts that are not the data visualization best practices. We will implement the stacked graph, sequential color scheme. Even though some factors considered correlated are actually not correlated, it might be due to lots of external factors such as the influence of alcohol, drug use and etc.

### 4.1 Which state to choose?



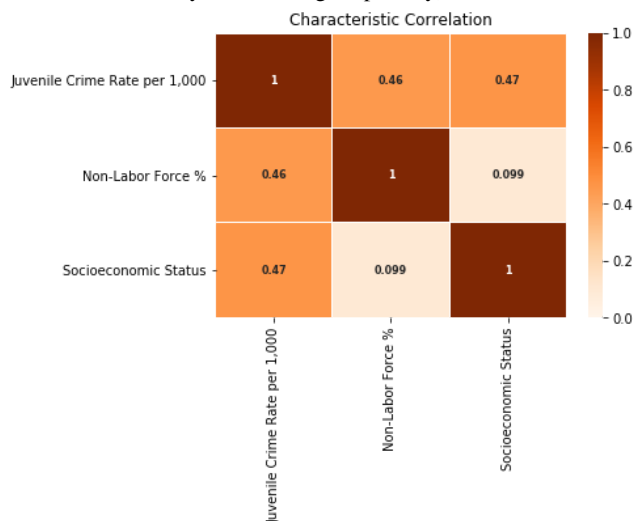
We discovered the crime data all over U.S. After the Principal Component Analysis, we found that California has the highest crime rate (including Rape, Assault and Murder) with a large population. Hence we pick California as our target of study.

#### 4.2 What factors influenced juvenile felony arrest rate the most?



By implementing the matplotlib, a 2D plotting library, for the purpose of feature importance, we are able to tell the three most correlated factors contributing to the crime rate.

The corresponding factors are 'Unemployment Rate', 'Micrograms per Cubic Meter (air pollution)' and 'Socioeconomic Status: Economically Disadvantaged (poverty)'.



Here, we see that the Juvenile Arrest Rate (Juvenile Crime Rate) is moderately related to the Unemployment Rate (Non-Labor Force %) and the Poverty Rate (Socioeconomic Status).

#### 4.3 How to deal with missing data and outliers ?

In the dataset given, we found some *N/A* and *S. N/A* means missing data and *S* means the data is too small compared to others. We replace those *N/A* value with the average of others. For those *S* values, we simply use 0 instead.

#### 4.4 Is there any counterintuitive results ?

It seems that air pollution has nothing to do with juvenile felony rate. While children live in concentrated poverty area may have higher criminal rate intuitively. But are those true?

### 5 VISUALIZATION DESIGN

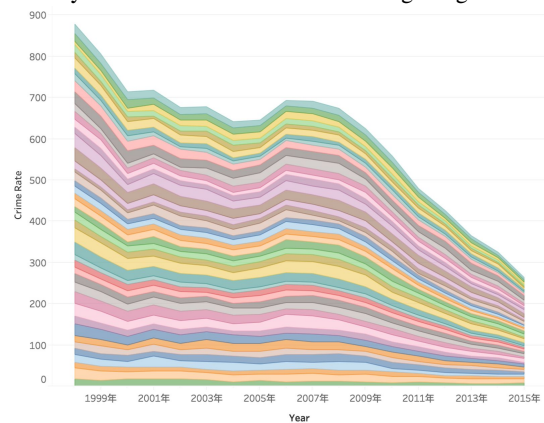
Our system consists of four different categories of factors:

General	School	Family	Society
gender	gang involvement	living in poor area	unemployment rate
age	bullying	child neglect and abuse	water pollution
race	intimate partner violence	adverse experience	air pollution
location	carry weapon to school	family income	tobacco, drug, alcohol use
time	school safety	housing affordability	

## 6 CASE STUDY

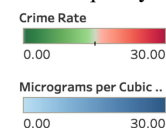
### 6.1 Crime Rate

To better express the underlying meaning of time series data, we choose stacked graph to show how crime rate change in every county in every county. From our graph, we can clearly see that the crime rate in every county is decreasing in 20 years and the security condition of whole California is getting better.



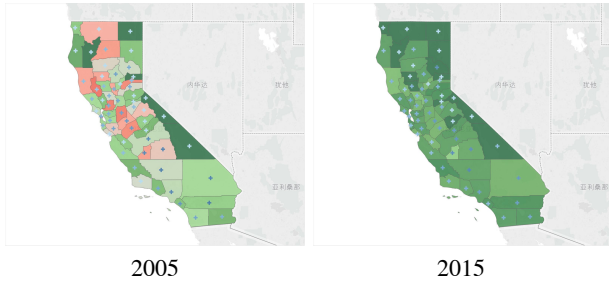
### 6.2 Air Pollution

We use tableau to draw a map of california to show the relationship between juvenile arrest rate and air pollution. In our map, the background color means juvenile arrest rate. Green shows in this county juvenile arrest rate is low, but red is the opposite situation. In the other side, the color of cross means micrograms of air pollution per cubic meter in every county. The darker color show the worse air quality in this county.



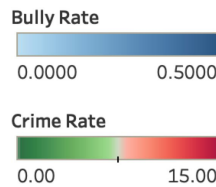
We use tableau to show the relationship between juvenile arrest rate and air pollution from 2000 to 2015, the condition of every five years is following, we find that more air pollution cannot lead

to more crime, but medial level air pollution can lead to more crime..

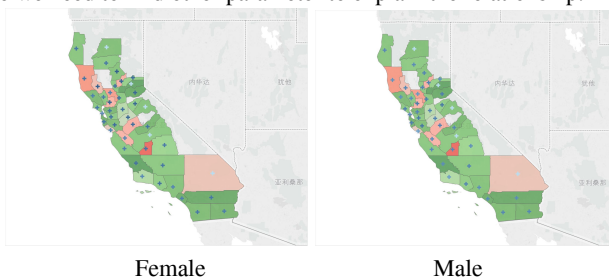


### 6.3 Teenager Bully

We use tableau to draw a map of california to show the relationship between juvenile arrest rate and teenager bully. In our map, the background color means juvenile arrest rate. Green shows in this county juvenile arrest rate is low, but red is the opposite situation. In the other side, the color of cross means the number of people consider they were bullied in every 1000 people in every county. The darker color show more bully happened in this county.



We use tableau to show the relationship between juvenile arrest rate and bully in 2015 and divide to different situation depending on gender. We were surprised to find that more bully means lower juvenile arrest rate. It is totally opposite to our experience, so we need to find other parameter to explain the relationship.



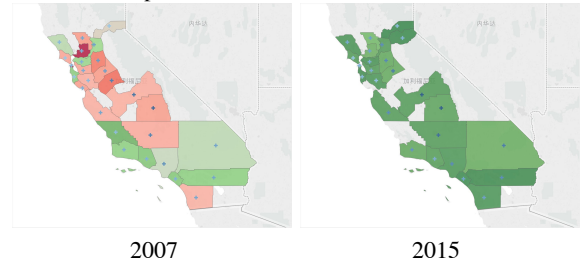
### 6.4 Poverty

We use tableau to draw a map of California to show the relationship between juvenile arrest rate and poverty. In our map, the background color means juvenile arrest rate. Green shows in this county juvenile arrest rate is low, but red is the opposite situation. In the other side, the color of cross means the percentage of people is below poverty line in every 100 people in every county. The darker color show more poverty level in this county.



We use tableau to show the relationship between juvenile arrest rate and poverty from 2007 and the situation of 2007 and 2015 is

in the following. However, we cannot find a clear relationship between this two parameters.

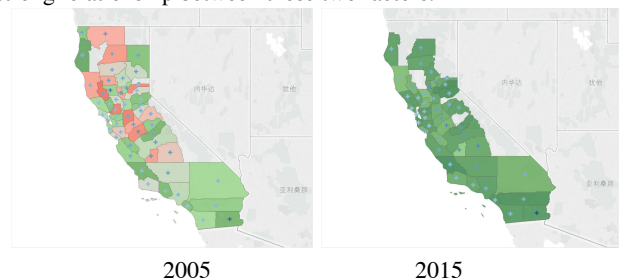


### 6.5 Unemployment Rate

We use tableau to draw a map of california to show the relationship between juvenile arrest rate and unemployment rate. In our map, the background color means juvenile arrest rate. Green shows in this county juvenile arrest rate is low, but red is the opposite situation. In the other side, the color of cross means the percentage of people is unemployment in every 100 people in every county. The darker color show more unemployment rate in this county.

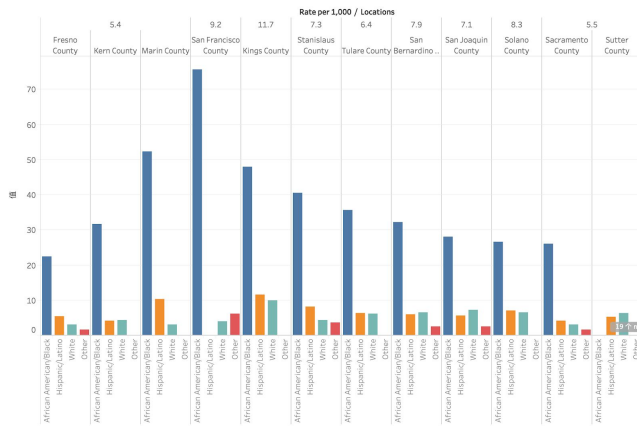


We use tableau to show the relationship between juvenile arrest rate and unemployment rate from 2000 and the situations of 2005 and 2015 are in the following. The pictures tell us there is no strong relationship between these two factors.



### 6.6 Race

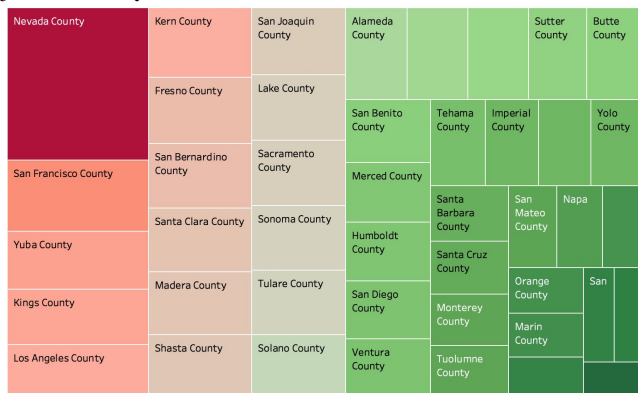
We use tableau to draw a bar chart to show the relationship between juvenile arrest rate and race. In our chart, different color means the ratio of different race. In the upper side, the number means the arrest number of teenagers per 1000 citizens.



After comparing data of all counties in California, we found out that race is an important factor related with juvenile felony rate. Black people tend to commit more crime than hispanic people. Followed by white people and asians.

### 6.7 High School Dropout

We use tableau to draw a correlation chart to show the relationship between juvenile arrest rate and high school dropout rate. We use tableau to draw a map of california to show the relationship between juvenile arrest rate and unemployment rate. There is a strong correlation between high school dropout rate and juvenile felony arrest rate.



High school dropout & felony arrest rate

## 7 CONCLUSION

Youth who have contact with the juvenile justice system are at increased risk for a number of negative long-term outcomes—such as injury, substance use and dependency, dropping out of school, and early pregnancy—when compared with the general youth population. Youth who have been detained also may face difficulty gaining the educational credentials they need to obtain sustained employment, and may be more likely to engage in criminal behavior as adults. Conditions that increase the likelihood of involvement with the juvenile justice system include family poverty, separation from family members including parental incarceration, a history of maltreatment, and exposure to violence in the home and community.

Additional risk factors for juvenile criminal activity are substance use or dependency, significant educational challenges, and mental illness. Of the youth who enter California's juvenile justice system, an estimated 30% have mental health issues. Youth who

have been held in detention have higher rates of attempted suicide and psychiatric disorders than youth who have not been detained. California's juvenile felony arrest rate declined by 73% between 1998 and 2015, from 19.6 arrests per 1,000 youth ages 10-17 to 5.3. Although all counties with data saw declines during this period, county-level rates vary widely; these ranged from 2.9 to 11.7 per 1,000 in 2015.

Among racial/ethnic groups with data, African American/Black youth are arrested for felony offenses at higher rates than their peers in other groups—24 arrests per 1,000 youth in 2015, compared to 5 arrests per 1,000 Hispanic/Latino youth and 3 arrests per 1,000 white youth. In 2015, more than three-quarters of all juvenile felony arrests in California involved youth of color.

After running an analysis on all the races (African American/Black, Hispanic, White), we found that African American/Black accounts for the most felony arrest rate, amounting to over 70 per 1,000 persons in San Francisco County, compared to less than 5 per 1,000 persons for White.

Based on the factors illustrated in case study, we found that race and high school dropout rate are the top two reasons for juvenile felony arrest rate. However, we found something interesting. First, when air pollution level is low or extra high, the crime rate is low; when air pollution level is middle, the crime rate is higher, so there is a reverse U shape between air quality and juvenile crime rate. In addition, more bully will not increase crime rate in empirical opinion, but it will decrease crime rate significantly. Furthermore, we cannot see clear relationship between unemployment or poverty and juvenile felony arrest rate, which is totally opposite to our experience.

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