**Detailed research of**

**wrongful convicted defendant**

**Objective**

Exoneration occurs when the conviction for a crime is reversed. This process can happen through demonstration of innocence, a flaw in the conviction, or otherwise. Study of the data of 1900 exoneration example can be particular helpful to understand and make inference about the total population.

**Research methods**

Since most of the data is categorical data, we mainly calculate the frequency of each variable and make contingency table. Chi-square test of independence and Linear regression model is also being used. Hypothesis testing is implemented through Chi-square test.

**Results: Overview**

40 variables on 1900 observations were analyzed through the statistical software. The descriptive statistics of the year of the crime, year of the conviction and the year of exoneration are displayed as followed:

|  |  |  |  |
| --- | --- | --- | --- |
| Year of the crime | Year of the conviction | Year of the exoneration | Years Lost |
| Min. :1955 | Min. :1956 | Min. : 1989 | Min. : 0.000 |
| 1st Qu.:1986 | 1st Qu.:1988 | 1st Qu.: 2001 | 1st Qu.: 2.100 |
| Median :1993 | Median :1995 | Median : 2008 | Median : 7.000 |
| Mean :1994 | Mean :1996 | Mean :2006 | Mean : 9.049 |
| 3rd Qu.:2002 | 3rd Qu.:2004 | 3rd Qu.:2014 | 3rd Qu.:14.700 |
| Max. :2016 | Max. :2016 | Max. :2017 | Max. :39.300 |

A two-year gap between the average time of crime occurrence and the average time of crime conviction is observed. A ten-year gap between the average time of crime conviction and the average time of exoneration is noticed. The years lost to the wrongful conviction ranges from 0 to 39.3 with a mean of 9.049 and a median 7.0.

Out of 1900 exnoerees, 90.14% or 1509 served in prison for their alleged crime while 9.86% or 165 did not. Out of 1509 incarcerated exonerees, 1536 of them served more than 1 year whereas only 364 were imprisoned for less than 1 year.

**Results: Race and Gender**

Total 1900 exnoerees can also be categorized by race and gender. Gender is classified as Male and Female. Race are grouped as Asian, Black, Caucasian, Hispanic, Native American and Other. There are two other distinct group called “back” and “caucasian” due to incorrect and lower-case spelling in the original data set.

According to the mosaic plot above and the statistic output, the numbers of exonerees tend to be heavily race and gender influenced. Male accounts to 90.5% of the total exonerees compared to Female, which only has 9.47%. Black men shared the highest number and percentage, respectively 873 and 45.9%, following by Caucasian men, respectively 614 and 32.3%. These two categories made up to 78.2% of the total exoneree number, significantly outweighed other groups.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Race Incarcerated** | **Female** | **Female%** | **Male** | **Male%** |
| Asian | 0 | 0.000 | 9 | 0.006 |
| Back | 0 | 0.000 | 1 | 0.001 |
| Black | 34 | 0.023 | 747 | 0.495 |
| caucasian | 1 | 0.001 | 0 | 0.000 |
| Caucasian | 68 | 0.045 | 465 | 0.308 |
| Hispanic | 8 | 0.005 | 163 | 0.108 |
| Native American | 1 | 0.001 | 5 | 0.003 |
| Other | 1 | 0.001 | 6 | 0.004 |

The total incarcerated exoneree number follows the same trend. Based on the table above, Black men, Caucasian men and Hispanic men combined contribute to 91.1% of total incarcerated cases. Asian and Native American Male have the lowest incarceration case under Male group. Asian, Native American and Other, have the lowest incarceration case under Female group.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Asian | Back | Black | caucasian | Caucasian | Hispanic | Native American | Other |
| 0.043 | 0.003 | 3.026 | 0.003 | 2.375 | 0.730 | 0.039 | 0.030 |

Average years lost to the wrongful conviction by race are shown as above. Furthermore, Male has an average of 5.66 years to Female, which has only 0.592 years in comparison.

Chi-square test of independence was performed to determine whether there is a significant relationship between race/gender and filing a state/civil right claim for wrongful sentence. The hypothesis and the test result are shown in below.

|  |  |
| --- | --- |
| Ho:Null Hypothesis  there is no relationship between race and filing a state claim | a: Alternative Hypothesis  there is a significant relationship between race and filing a state claim |

> chisq.test(table(df1$race, df1$filing\_state))

Pearson's Chi-squared test

data: table(df1$race, df1$filing\_state)

X-squared = 53.91, df = 7, p-value = 2.45e-09

|  |  |
| --- | --- |
| Ho:Null Hypothesis  there is no relationship between race and filing a civil right claim | a: Alternative Hypothesis  there is a significant relationship between race and filing a civil right claim |

> chisq.test(table(df2$race, df2$filing\_civil))

Pearson's Chi-squared test

data: table(df2$race, df2$filing\_civil)

X-squared = 19.321, df = 7, p-value = 0.00724

|  |  |
| --- | --- |
| Ho:Null Hypothesis  there is no relationship between gender and filing a state claim | a: Alternative Hypothesis  there is a significant relationship between gender and filing a state claim |

> chisq.test(table(df3$gender, df3$filing\_state))

Pearson's Chi-squared test with Yates' continuity correction

data: table(df3$gender, df3$filing\_state)

X-squared = 30.468, df = 1, p-value = 3.395e-08

|  |  |
| --- | --- |
| Ho:Null Hypothesis  there is no relationship between gender and filing a civil right claim | a: Alternative Hypothesis  there is a significant relationship between race and filing a civil right claim |

> chisq.test(table(df4$gender, df4$filing\_civil))

Pearson's Chi-squared test with Yates' continuity correction

data: table(df4$gender, df4$filing\_civil)

X-squared = 7.6321, df = 1, p-value = 0.005734

All Null Hypothesis can be rejected since all the p value are smaller than 0.05. We can state that there is a significant relationship between race/gender and filing a state/civil right claim if wrongfully convicted for a crime.

**Results: Type of crimes**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Crime | Total Case | Seek state compensation | Seek state compensation%\* | Seek civil right compensation | Seek civil right compensation%\* |
| Murder | 783 | 360 | 21.5 | 454 | 23.90 |
| Sexual Assault | 296 | 169 | 10.09 | 114 | 6.00 |
| Drugs | 213 | 22 | 1.31% | 26 | 1.37 |
| Child abuse | 224 | 90 | 4.73 | 72 | 3.79 |
| Robbery | 96 | 45 | 2.68 | 27 | 1.42 |
| Other | 288 | 92 | 5.49 | 97 | 5.11 |

\*seek state/civil right compensation %: the % of the total 1900 exonerees

|  |  |  |  |
| --- | --- | --- | --- |
| Crime | Seek state compensation | State claim  granted | State claim  Granted % |
| Murder | 360 | 263 | 73.05 |
| Sexual Assault | 169 | 148 | 87.58 |
| Drugs | 22 | 13 | 59.09 |
| Child abuse | 20 | 61 | 67.78 |
| Robbery | 45 | 31 | 68.89 |
| Other | 92 | 53 | 57.61 |

\*seek claim granted %: the % of the exonerees that seek state compensation

6 Major crimes are categorized for the total 1900 exonerees. Those are

Murder, Sexual Assault, Drugs, Child abuse, Robbery and Other.

Based on the table above, it is easy to notice that murder cases have largest percentage of seeking compensations whether it is state or civil rights. Drug-related cases have the lowest percentage of making claims. All crimes, excluding murder case, have larger percentage in seeking state compensation than seeking civil right compensation. Murder case is the only category where exonerees are more willing to seek civil right compensations than seeking state compensation.

**Results: Exoneration groups**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Exoneration | Total Case | Seek state compensation | Seek state compensation%\* | Seek civil right compensation | Seek civil right compensation%\* |
| Through CIU | 235 | 82 | 4.90 | 60 | 3.16 |
| Assisted by IO | 0 | 0 | 0 | 0 | 0 |
| Guilty Pleas | 401 | 97 | 5.79 | 100 | 5.26 |
| DNA | 344 | 248 | 14.81 | 192 | 10.11 |
| Death penalty | 116 | 49 | 2.58 | 65 | 3.42 |

\*seek state/civil right compensation %: the % of the total 1900 exonerees

|  |  |  |  |
| --- | --- | --- | --- |
| Exoneration | Seek state compensation | State claim  granted | State claim  Granted %\* |
| Through CIU | 82 | 64 | 78.05 |
| Assisted by IO | 0 | 0 | 0 |
| Guilty Pleas | 97 | 71 | 73.19 |
| DNA | 248 | 229 | 92.34 |
| Death penalty | 49 | 34 | 69.39 |

\*seek claim granted %: the % of the exonerees that seek state compensation

There exoneration process can also be classified as 5 groups. “Through CIU” means that the result of work was completed by Conviction Integrity Unit. “Assisted by IO” means the exoneration was helped by an innocence organization. “Guilty Pleas” indicated that in the exoneration where the defendant pled guilty. “Death penalty” revealed the exoneration was assisted by DNA analysis. “Death penalty” showed that the defendant was sentenced death penalty.

We can easily observe that the defendant who got exonerated by DNA analysis are more willing to file the state and civil right claim while exonerees being sentenced by death penalty are more reserved to file a claim.

The percentage of the state compensation that was awarded to the exoneree is shown in the second table. All 5 types of exoneration have considerably high rate of receiving state award. Exoneration evidenced by DNA analysis have 92.34% of chance prevailing a state claim, which perhaps explained that the majority of exonerees backed by DNA documentation are more willing to file a claim. Unfortunately, out of 1900 examples, none of them were helped by an Innocence organization.

**Results: State and filing claim**

|  |  |
| --- | --- |
| State claim by State | Civil right claim by State |
| > table(Crime$State, Crime$`State Claim Made?`)    0 1  Alabama 18 8  Alaska 0 0  Arizona 0 0  Arkansas 0 0  California 114 59  Colorado 6 1  Connecticut 7 13  Delaware 0 0  District of Columbia 8 8  Florida 53 8  Georgia 0 0  Guam 0 0  Hawaii 3 0  Idaho 0 0  Illinois 70 114  Indiana 0 0  Iowa 10 4  Kansas 0 0  Kentucky 0 0  Louisiana 13 34  Maine 2 0  Maryland 20 4  Massachusetts 18 33  Michigan 42 26  Minnesota 7 4  Mississippi 2 14  Missouri 31 8  Montana 9 0  Nebraska 2 7  Nevada 0 0  New Hampshire 1 0  New Jersey 13 14  New Mexico 0 0  New York 59 165  North Carolina 29 30  North Dakota 0 0  Ohio 15 44  Oklahoma 25 9  Oregon 0 0  Pennsylvania 0 0  Puerto Rico 0 0  Rhode Island 0 0  South Carolina 0 0  South Dakota 0 0  Tennessee 16 2  Texas 214 95  Utah 9 5  Vermont 0 1  Virginia 17 29  Washington 29 15  West Virginia 4 6  Wisconsin 30 18  Wyoming 0 0 | > table(Crime$State, Crime$`Non-Statutory Case Filed?`)    0 1  Alabama 22 4  Alaska 4 4  Arizona 14 4  Arkansas 4 2  California 77 96  Colorado 4 3  Connecticut 12 8  Delaware 0 2  District of Columbia 10 6  Florida 51 10  Georgia 25 4  Guam 1 0  Hawaii 2 1  Idaho 0 2  Illinois 37 147  Indiana 5 19  Iowa 11 3  Kansas 3 4  Kentucky 4 7  Louisiana 22 25  Maine 1 1  Maryland 20 4  Massachusetts 24 27  Michigan 36 32  Minnesota 11 0  Mississippi 9 7  Missouri 22 17  Montana 7 2  Nebraska 3 6  Nevada 3 6  New Hampshire 1 0  New Jersey 14 13  New Mexico 5 1  New York 94 130  North Carolina 32 27  North Dakota 2 0  Ohio 33 26  Oklahoma 18 16  Oregon 12 4  Pennsylvania 30 30  Puerto Rico 2 4  Rhode Island 4 1  South Carolina 4 3  South Dakota 3 1  Tennessee 12 6  Texas 281 28  Utah 12 2  Vermont 0 0  Virginia 37 9  Washington 25 19  West Virginia 3 7  Wisconsin 40 8  Wyoming 1 2 |

Top 5 states that have largest number of state claims are New York(165), Illinois(114), Texas(95), California(59), and Ohio(44). Texas is the only state that have stronghold in Republican party and Ohio is considered to be a “swing state”. New York, Illinois and California are often referred as the “big Three”, the most democratic states in the United State.

Top 5 states have the least amount state claims(exclude 0 claim) are Vermont(1), Colorado(1), Tennessee(2), Minnesota(4), and Iowa(4)

Top 5 states that have largest number of civil right claims are: Illinois(147), New York(130), California(96), Michigan(32) and Pennsylvania(30). Except the “big three”, Michigan and Pennsylvania are both considered to the “swing state”.

Top 5 state have the least amount civil right claims(exclude 0 claim) are: South Dakota(1), Rhode Island(1), New Mexico(1), Maine(1), and Hawaii(1).

There is a strong likelihood for exonerees that living in liberal states to file either a state claim or civil right claim for their wrongful conviction.

**Results: Relationship between recovery amount and the year lost to conviction**

> df\_recovery\_yearlost <- data.frame(recovery, yearlost)

> df\_recovery\_yearlost <- na.omit(df\_recovery\_yearlost)

> df\_recovery\_yearlost <- df\_recovery\_yearlost %>% filter(recovery > 0)

> df\_recovery\_yearlost <- df\_recovery\_yearlost %>% filter(recovery != "unknown")

> df\_recovery\_yearlost <- df\_recovery\_yearlost %>% filter(recovery != "Undisclosed")

> df\_recovery\_yearlost <- df\_recovery\_yearlost %>% filter(recovery != "see above")

> df\_recovery\_yearlost <- df\_recovery\_yearlost %>% filter(recovery != "uknown")

> sample <- sample(c(TRUE, FALSE), nrow(df\_recovery\_yearlost), replace = T, prob = c(0.6,.04))

> train <- df\_recovery\_yearlost[sample, ]

> test <- df\_recovery\_yearlost[!sample, ]

> model\_recovery\_yearlost <- lm(recovery1 ~ yearlost1, data = train)

> summary(model\_recovery\_yearlost)

Call:

lm(formula = recovery1 ~ yearlost1, data = train)

Residuals:

Min 1Q Median 3Q Max

-8406266 -2455193 -746459 1302907 20739319

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 594365 397076 1.497 0.135

yearlost1 268994 26848 10.019 <2e-16 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4317000 on 401 degrees of freedom

Multiple R-squared: 0.2002, Adjusted R-squared: 0.1982

F-statistic: 100.4 on 1 and 401 DF, p-value: < 2.2e-16

A Linear regression model is built to examine the relationship between the recovery, which as the responsive variable, amount and year lost to the wrongful conviction, which as the explanatory variable.

Base on the model result, the p value is smaller than 2.2e-16, which indicate the relationship between the sate award amount and the year lost during the exoneration process tend to be statistically significant. However, R-squared of 0.2002 indicate a very bad fit of this linear regression model.

**Conclusion**

Exoneration process can be long-lasting and difficult for many people. It takes 10 year in average for the researched 1900 exonerees to complete the whole process.

The distribution of exonerees and incarcerated exonerese appeared to be heavily race and gender biased. Black and Caucasian as well as Hispanic men contributed to the majority of both groups.

Murder case has the largest possibility of seeking compensations whether it is state or civil right. Drug-related offense has the lowest rate.

Exoneration procedure complimented by DNA analysis have the highest rate of seeking recovery as well as successfully collecting the reward while the defendants who has been sentenced to death have the lowest.

There is a strong likelihood for exonerees that living in liberal states to file either a state claim or civil right claim for their wrongful conviction.

There is a significant relationship between the year lost to the wrongful conviction and the recovery amount being collected by exonerees. However, the relationship isn’t necessarily linear in terms of the year lost being an explanatory variable.

Most of the data extracted from the original dataset is categorical data. It is somewhat difficult to perform regression analysis between categorical data even they are transformed into dummy variable. More numerical data should be obtained for further analysis and research.

Appendix