

## LOCATION, LOCATION, LOCATION: AN ANALYSIS OF ARSON RISK FACTORS IN PENNSYLVANIA CITIES

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### **ABSTRACT**

Arson is a criminal act defined as intentionally burning or attempting to burn any property belonging to another or one's own property in an attempt to defraud (UCR, 2015). There are many difficulties in identifying, investigating, and prosecuting arson cases. Most arson research focuses on the arsonist's mental health, but few researchers attempt to identify aggregate correlates of arson. This study employs data from the United States Census and the Uniform Crime Reports to assess the association of arson offenses in Pennsylvanian cities and city-level data on race, age, sex, vacant housing units, and families living under poverty.

### **INTRODUCTION**

Arson is a criminal act defined as intentionally burning or attempting to burn any property belonging to another or one's own property in an attempt to defraud (UCR, 2015). Arson is split into three different categories: structure, mobile, and outside. Structure includes buildings such as residential buildings, office buildings, and storage buildings. Mobile arson includes motor vehicles and motor homes, and outside includes forest fires, garbage cans, and anything not included in the previous two categories (UCR, 2015). Arson is one of the least investigated and researched crimes in the United States. This is partly attributed to the difficulty of investigating and proving arson cases. Despite the relatively low numbers of arson cases reported per year compared to other serious crimes, arson is an extremely expensive crime which costs victims between thousands and billions of dollars.

Arson research is, by comparison to other crimes, scant. The majority of arson research tends to focus around the perpetrators, whose reasons for setting things ablaze range from psychosis to revenge to simple fire play. There is a great amount of research of the pathology of the arson offender and rather than the characteristics of the offense location. Researchers conclude that there is a link between arson offenses and mental health. A higher percentage of arsonists than other offenders have a history of mental health treatment, and are more likely to exhibit signs of schizophrenia, manic depression psychosis, or psychogenic psychosis. (Hagenauw et al., 2015). However, more recently, researchers have begun to connect arson offending and location. This study identifies predictive factors associated with arson offenses. Unlike other research, this paper focuses on the socioeconomic, racial, sex, and age makeup of cities.

### **LITERATURE REVIEW**

#### *Arson and Juveniles*

While the majority of arson research focuses on the offender and their mental state when offending, arson research also overwhelmingly supports the notion that the majority of arson offenses are committed by juveniles. A 1997 report published by the U.S. Department of Justice's Office of Juvenile Justice and Delinquency Prevention writes that of the arson cases cleared by law enforcement in 1997, 46% of them were committed by a juvenile. At the time, arson cases had the highest rate of juvenile offenders than any other criminal offense (Snyder, 1997). Another report published by the Office of Juvenile Justice and Delinquency Prevention in 2005 splits juvenile firesetters in to two different categories: children ages 12 and under and adolescents ages 13 to 18 (Putnam & Kirkpatrick, 2005).

## M. HERNITER: ARSON RISK FACTORS IN PENNSYLVANIA CITIES

A 1999 study of 75 juvenile firesetters by George Sakheim and Elizabeth Osborn suggests that juveniles, who are generally powerless next to adults, use arson as a weapon against authority. However, the study concludes, this is not the only reason for juvenile arson offending. Sakheim and Osborn's data show that juvenile firesetting is not limited to just one explanation. They identify three different types of juvenile firesetters: the sexually motivated firesetters, the "cry for help" firesetter, and the "severely disturbed" firesetters. The sexually motivated firesetters do so because he or she is aroused by and gets pleasure from fires. Those who are crying for help use fires to bring attention to the traumatizing troubles in their life like abuse or neglect. In this situation, the fires are like smoke signals. The "severely disturbed" firesetters are in a group of firesetters affected by psychosis and paranoia (Sakheim & Osborn, 1999).

In a 2002 quantitative study, *Aggression and Fire: Antisocial Behavior in Firesetting and Nonfiresetting Juvenile Offenders Juvenile*, Timothy Stickle and Elaine Blechman analyzed the association of firesetting and antisocial behavior among juvenile offenders. They found that juvenile firesetters were more likely to exhibit aggression and antisocial behaviors than non-firesetting juvenile offenders (Stickle & Blechman, 2002). This is consistent with the previously mentioned research on arson and mental health. Arson offenders are widely considered to consist of a large percentage of people with various mental health issues. This pattern is evident among both juvenile and adult firesetters.

### *Arson and Location*

The location of an offense is also important to understanding the causes of arson. A recent research article published in 2017 by McCutcheon et al. (2017) found through its research that both the vacancy rate of buildings in a city and the racial makeup of that city are positively correlated with arson offenses. The authors created a two-fold analysis of both arson types and arson locations, focusing on the socioeconomic makeup, racial diversity, and the number of vacant buildings in the area. This research is similar to this paper in scope, but McCutcheon et al. include fewer independent variables. They write their findings are similar to those of studies which research patterns surrounding other crimes, like homicide.

Grubb and Nobles (2016) examine the spatiotemporal clustering of arson incidents within densely populated urban areas. Using data from crime incidents recorded by the Los Angeles County Sheriff's Department between January 1, 2005, and December 31, 2012, they examined the relationship between near-repeat patterns and the different arson classifications.

Grubb and Nobles (2016) compare the expected and observed total arson ratios of arson for 1, 4, 7, and 14 days. They concluded that in general there is a risk for near repeat arson incidents up to fourteen days after the initial crime and is constricted to a two block radius of where the first event occurred. The data suggests that in cases of residential, non-residential, and mobile arson there are three separate near repeat patterns. While residential arsons were rarely followed by near repeat incidents, the near repeat pattern was most prevalent within mobile arson. They also found that nighttime arson incidents were much more likely to result in near repeat offenses in contrast to daytime incidents (Grubb and Nobles, 2016).

## **METHODOLOGY**

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We tested the correlation between arson offenses in Pennsylvanian cities and population descriptors collected by the United States Census. Few studies have examined the correlation between arson and aggregate correlates such as poverty, race, and other city-level data.

The unit of analysis is the city in Pennsylvania. Pennsylvania was chosen because of its diverse makeup of large cities and small rural towns. Separation by municipality is important because it allows us to narrow the focus to as small a geographic area as possible while still collecting the population descriptors. Cities create boundaries and often vary greatly from one to the next when it comes to its population makeup. The dependent variable is the number of arson offenses by city as collected in the FBI's 2016 Uniform Crime Report (UCR). The UCR data is pre-sorted by municipality in each state, but because the UCR relies on local police departments to report all criminal incidents it only includes data from municipalities which choose to do so. The UCR will also not publish any arson data for a

municipality unless the municipality reports the information for all 12 months of the year. If a municipality fails to submit one month’s worth of arson data, no data will be published at all.

The independent variables are the racial, economic, geographical, and population makeup of the cities reported by the 2010 and 2000 national census. We specifically used the information reporting the population size of the city, the density of the city, the racial makeup of the city, the percentage of the population under 18 years old and between the ages of 18 to 24 years old, the percentage of males in the population, and the percentage of families living under the poverty line. Census data is pre-sorted by municipality in each state, but does not offer the same data by municipality every year. The data on percentage of the population living under the poverty line is only available in 2000. It is also important to note that the municipalities listed in the UCR and census data do not match up. The census contains more municipalities, but the UCR data relies on law enforcement agencies to report data and not all small towns have independent police forces.

**FINDINGS**

Table 1 shows the results of the negative binomial regression analysis. Negative binomial regression was employed given that the dependent variable was a count of arson incidents. Four of the nine independent variables are positively correlated with arson offenses. The parameter estimate results indicate that arson offenses are positively correlated with a city’s Black, Asian, and Hispanic populations. It is also positively correlated with a city’s percentage of families living under poverty. These findings were expected and are consistent with those of other crime types.

Surprisingly, we found no significant relationship with vacant housing units and arson offenses. This contradicts with the findings discussed earlier in *Arson in Chicago: Patterns and Correlates* by McCutcheon et al. There are a couple reasons why results between the two regressions analyses differ. For one, McCutcheon’s research strictly focuses on Chicago and this may be an anomalous finding or one that only is applicable to high-density cities. The research in the paper analyzes all cities in the state of Pennsylvania, which includes areas ranging from rural to urban, possibly diluting that finding.

It is also surprising to find that age and sex are not significantly related to arson offenses. Based on general research on crime and age, we expected to find a positive correlation between arson, males, and the population under twenty-four. This is peak age at which crime is committed and there is often a correlation seen with other crimes. Previous arson research also links young juvenile males to arson offenses.

Table 1.

| Parameter                         | Estimate | Standard Error | 95% Confidence Limits | P > ChiSq |
|-----------------------------------|----------|----------------|-----------------------|-----------|
| Intercept                         | -1.3805  | 0.3664         | -2.0986 -0.6623       | 0.0002    |
| Percent White                     | -0.0024  | 0.0034         | -0.0091 0.0042        | 0.4738    |
| Percent Black                     | 0.0238   | 0.0161         | -0.0077 0.0552        | 0.1390    |
| Percent Asian                     | 0.0664   | 0.0566         | -0.0445 0.1774        | 0.2405    |
| Percent Hispanic                  | 0.0781   | 0.0275         | 0.0241 0.1320         | 0.0046    |
| Percent of Families Under Poverty | 0.0518   | 0.0237         | 0.0053 0.0982         | 0.0290    |
| Number of Vacant Housing Units    | 0.0227   | 0.0216         | -0.0197 0.0651        | 0.2938    |

LIMITATIONS

This research utilizes data collected by two different agencies, the FBI and the United States Census Bureau. The FBI compiles its information on crime in to the annual Uniform Crime Report (UCR). This report has several different limitations. First, the UCR data is self-reported by local law enforcement and may not contain all the information about the crimes. The FBI includes a disclaimer that if a city fails

## M. HERNITER: ARSON RISK FACTORS IN PENNSYLVANIA CITIES

to provide crime information for all twelve months of the year, they will not include any of the crime counts. That is to say that if a town only gives arson counts for eleven out of the twelve months none of that information will be reported in to the UCR data tables.

Secondly, the cities did not fully align between the UCR and the Census data. The Census table lists more cities than the UCR table does. This may be due to cities combining police forces in Pennsylvania and present to the UCR as one city. This forced us to only use the cities which are listed in both the UCR and Census data sets.

Lastly, over ninety percent of the cities in Pennsylvania reported zero arson cases in 2016. Because of the overwhelming lack of arson offenses, it may skew the regression analysis to display independent factors and less statistically significant than if the analysis only took into account the cities which experienced arson.

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