

THE PENNSYLVANIA STATE UNIVERSITY  
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DEPARTMENT OF ECONOMICS

The Effect of the Prevalence of Community Murals on Neighborhood Crime Rates in  
Philadelphia

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A thesis  
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## ABSTRACT

In this research paper, I will be studying the relationship between the number of community murals within a neighborhood, and the neighborhood's crime rates in Philadelphia.

Crime, particularly violent crime, is prevalent in Philadelphia; Philadelphia regularly places on the real estate analytics company NeighborhoodScouts "Top 100 Most Dangerous Cities in America" list—and Philadelphia's crime rate consistently ranks higher than the national average. Philadelphia also houses one of the nation's most prolific art programs, the Mural Arts Program, which has created over 2,600 public art pieces for the city. These factors have incentivized me to study whether there is a significant relationship between the two. The results of this type of research could significantly influence future city planning decisions.

In particular, I will be analyzing seven neighborhoods within Philadelphia that contain a total of 56 official community murals. I have collected data on each neighborhood's yearly population, total number of homicide cases, total number of thefts, and total amount of money received from storefront-improvement-grants for this analysis. This study spans from the year 2008 to 2015.

After running the regressions, I found two statistically significant relationships. Using a 95% confidence level, I found that the total number of community murals and levels of violent crime, represented by cases of homicide, were significantly related. Interestingly, I also found that the total amount of money from storefront-improvement-grants was significantly related to levels of non-violent crime, which were defined as the number of thefts. However, there were significant limitations to my research that I will expand upon in the Discussion section.

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## **Chapter 1**

### **Introduction**

Research has shown that crime can inflict considerable expenses on its surrounding communities. A study called “The Aggregate Burden of Crime” explored the actual numerical expense that different crimes can cost. The researchers studied approximately 49 million crimes and attempted crimes within the United States within a year (Anderson, 1999). They found that governments pay \$4.5 billion annually to pay for medical insurance for uninsured gunshot victims—and they also found that communities across America had a total of \$15 billion in property stolen. High crime rates can mean high expenses for communities, which can hurt economic growth.

Interestingly, physical disorder has been linked with increased crime. In the 1980s, Harvard professor James Q. Wilson and Rutgers professor George Kelling worked together to create the “Broken Windows Theory,” which states that just one broken window in a neighborhood can spur more and more crime. Put more generally, the theory argues that visible signs of crime, anti-social behavior, and civil disorder can create an environment that encourages further crime and disorder, catalyzing a downward spiral.

This theory was tested and supported by epidemiologist Charles Branas’s research. Branas, along with criminologist John MacDonald and other scholars, studied the crime rates around vacant buildings and vacant parking lots in Philadelphia. To test the effect of physical disorder, Branas compared freshly renovated buildings to those without renovations, and

compared community-cleaned lots to those that hadn't been cleaned. Around renovated vacant buildings, Branas found a marked 39% decline in gun violence, while around the cleaned vacant lots, Branas found a 5% decline in gun violence.

### **The Effects of Art on Community Health and Economic Growth**

Perhaps for a similar reason that physical disorder has been tied to increased crime, physical beautification has long been used to positively influence those in a community. More specifically, works of public art have continually been used to raise community spirits and stimulate economic growth.

For example, public art can create attractive communities that can lead to increased tourism. In Chicago, there was a temporary public art exhibit called "Cows on Parade" that led to a \$200 million increase in revenue from tourism. In comparison, the cost of creating the 300 sculptures was only \$1.5 million.

Public art can also increase citizens' community attachment, which is correlated with the community's economic growth. In 2012, the Knight Foundation's Soul of Community conducted a study on what factors contributed to residents' attachment to their communities, and what role that attachment played in their community's economic growth. The researchers studied over 40,000 people in over 40 cities, and found that the "aesthetics of a place – its art, parks, and green spaces," were more important than the area's education, safety, and local economy to potential residents. The researchers also found that cities with the "highest levels of attachment had the highest rate of GDP growth" (Loflin, 2013).

## Literature Review

The research surrounding art's concrete, quantitative effect on crime is limited.

One study, called "How Public Art Influences the Economic Development of Urban Neighborhoods within Chicago," focused on the relationship between the number of public artworks and crime rates in 11 Chicago wards. The study included an analysis of about 289 total art pieces and found a significant relationship between the total number of public art works per ward in Chicago and the ward's number of crime instances and new business licenses across the years 2001 to 2016 (Kastelman, 2017).

Another study, led by a researcher named Knoblauch and called the "Relations of Public Art, Collective Efficacy, and Crime in Chicago," set out to study whether the amount of public art involvement in a community could contribute to increased collective efficacy, and serve as a violence prevention tool in neighborhoods. Knoblauch studied the years 2010 to 2014 and unfortunately found no direct relationship between public art and crime (Knoblauch, 2015).

There are few research papers that explicitly study the quantitative relationship between artworks and crime rates, probably because of the complexity of measuring the effects of art. Therefore, in an effort to further the conversation surrounding the measurable effects of art, in this thesis I will explore the relationship between the prevalence of community murals and the crime rate of Philadelphia neighborhoods.



## **Chapter 2**

### **Research Methodology**

#### **A) Outcome Variables:**

I chose to analyze violent crime cases and non-violent crime cases as my outcome variables. In these data sets, violent crime consists of the number of new homicide cases, per neighborhood, per year. Non-violent crime consists of the number of new theft cases per neighborhood, per year.

I represented these variables with homicide cases and thefts because of the limited data available on crime per neighborhood, per year in Philadelphia during this time period. Similar limiting factors of this research will be discussed further in the Limitations section.

#### **B) Unit of Observation:**

Because the Philadelphia Mural Arts program described the placement of each mural with regard to its neighborhood, I chose the Philadelphia neighborhood as my unit of observation. I will be studying the following seven neighborhoods, which are the ones that include murals according to the Philadelphia Mural Arts program website:

**Table 1. Total Number of Murals Per Neighborhood**

Neighborhood	Total Number of Murals *
Center City	30
Fishtown / Kensington	7
Germantown / Chestnut Hill	2
North Philadelphia	12
Roxborough / Manayunk / East Falls	6
South Philadelphia	14
West Philadelphia	10

\*As of March 2020

It is important to note that these neighborhoods vary in geographic size—I will further discuss issues like these in the Limitations section.

### **C) Model: Fixed Effects Regression**

To analyze the effects that the murals have on these seven neighborhoods' crime rates and creation of commercial licenses, I will be using a fixed effects regression model. Because each neighborhood might have differing levels of wealth, which could influence crime rates, I will use the fixed effects regression model to control for those differences between neighborhoods. With this method, I can remove the effect of time-invariant characteristics to measure the real effects of the predictors on crime rates.

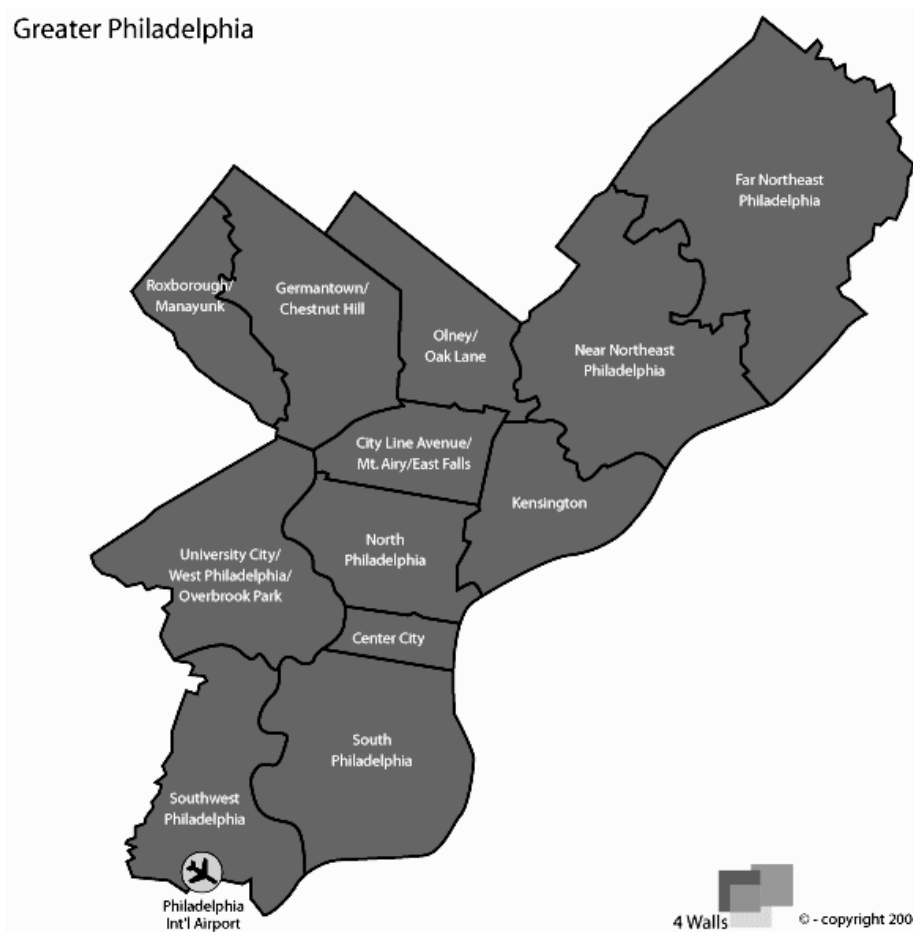
This model will include the following three predictor variables: 1) the annual total number of murals, 2) the neighborhood's population, and 3) the annual amount of business investment within each neighborhood.

To measure yearly neighborhood population, I will use the Census Blocks data provided by the Philadelphia Open Data website. The amount of business investment will be represented by the total amount of money awarded from storefront-improvement-grants, given to businesses to renovate their exteriors. This information will account for potentially unequal levels of outside investment into neighborhoods. These variables will constitute the following model:

$$Y_{it} = \alpha_i + \beta_1 * (\text{Total Number of Murals})_{i(t-1)} + \beta_2 * (\text{Population})_{it} + \beta_3 * (\text{Storefront Improvement Grants})_{it} + \varepsilon_{it}$$

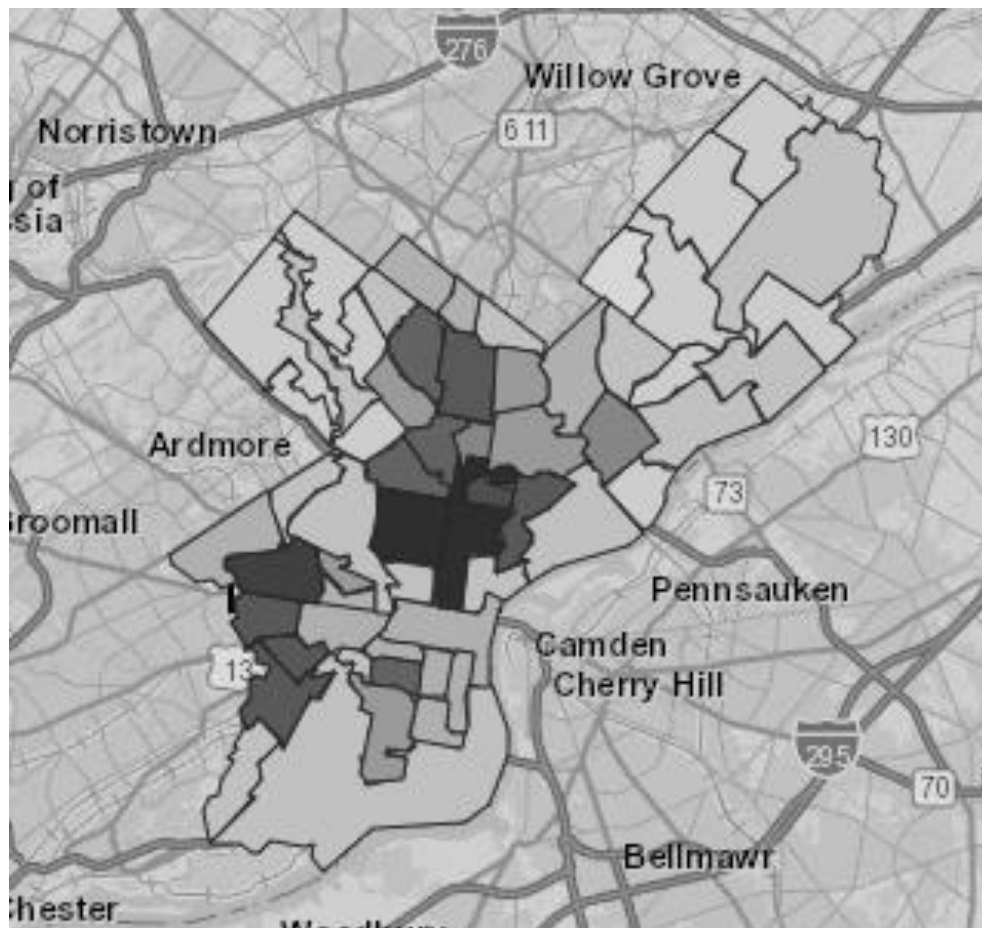
#### **D) Data Collection:**

The demarcations of neighborhoods can differ based on the information source. Therefore, the different geographical definitions of neighborhoods is another potential limiting factor of this research. In this study, I used a variety of methods to achieve similar neighborhood definitions among my variables. To try to standardize the neighborhood geographic lines, I collected data that was as closely situated as possible within the following template of neighborhood lines:



**Figure 1. Philadelphia Neighborhood Lines**

I found data on the number of homicide cases per neighborhood, per year from the Philadelphia DataHub website, which sources its homicide data from the Philadelphia Police Department public records. Then, I studied the website's data visualization, which showcases many smaller demarcations within larger neighborhoods. I checked that my datasets aggregated to fall within my desired neighborhood lines (as delegated by the earlier template).



**Figure 2. Homicide Cases Dataset Neighborhood Lines**

As for non-violent crimes, I amassed the annual number of thefts per neighborhood from the website [data.phila.gov](http://data.phila.gov), which also sourced its numbers from the Philadelphia Police Department public records. This website separated the number of thefts into districts, which I paired together to form larger neighborhood groupings:



**Figure 3. Non-violent Crime Cases Dataset Neighborhood Lines**

The amount of money in storefront-improvement-grants per neighborhood, per year was retrieved from OpenDataPhilly, the official data repository for Philadelphia. I delegated all of the grants to their respective neighborhoods by manually pairing up their address with their neighborhood geographic location, using Google Maps; there were about 450 observations in total.

## Chapter 3

### Results

#### A) Regression #1: Violent Crime Cases

$$\text{Violent Crime Cases}_{it} = \alpha_i + \beta_1 * (\text{Total Number of Murals})_i + \beta_2 * (\text{Population})_{it} + \beta_3 * (\text{Storefront Improvement Grants})_{it} + \varepsilon_{it}$$

NumHomicides	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
POP	0	(omitted)				
TotalNumMurals	<b>-.9237087</b>	<b>.4405151</b>	<b>-2.10</b>	<b>0.041</b>	<b>-1.809911</b>	<b>-.0375065</b>
TotalSIG	<b>-8.34e-06</b>	<b>.0000154</b>	<b>-0.54</b>	<b>0.591</b>	<b>-.0000393</b>	<b>.0000226</b>
_cons	<b>20.86351</b>	<b>2.083748</b>	<b>10.01</b>	<b>0.000</b>	<b>16.67155</b>	<b>25.05547</b>

**Figure 4. Effect of Murals on Homicides Regression Results**

After running my regression, I saw that the predictor variable population had collinearity issues with the other two predictor variables. With this in mind, I omitted the predictor population from the subsequent regressions to form a new model:

$$\text{Violent Crime Cases}_{it} = \alpha_i + \beta_1 * (\text{Total Number of Murals})_i + \beta_2 * (\text{Storefront Improvement Grants})_{it} + \varepsilon_{it}$$

NumHomicides	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
TotalNumMurals	<b>-.9237087</b>	<b>.4405151</b>	<b>-2.10</b>	<b>0.041</b>	<b>-1.809911</b>	<b>-.0375065</b>
TotalSIG	<b>-8.34e-06</b>	<b>.0000154</b>	<b>-0.54</b>	<b>0.591</b>	<b>-.0000393</b>	<b>.0000226</b>
_cons	<b>20.86351</b>	<b>2.083748</b>	<b>10.01</b>	<b>0.000</b>	<b>16.67155</b>	<b>25.05547</b>

**Figure 5. Effect of Murals on Homicides Regression Results Part II**

These results showcase that at a 95% confidence level, the total number of murals (TotalNumMurals) is significantly correlated with the total number of homicides (TotalHomicides). However, the total amount of storefront-improvement-grants is not significantly correlated with the total number of homicides.

### B) Regression #2: Non-Violent Crime Cases

Non – Violent Crime Cases<sub>it</sub> =  $\alpha_i + \beta_1 * (\text{Total Number of Murals})_i + \beta_2 *$

(Storefront Improvement Grants)<sub>it</sub> +  $\varepsilon_{it}$

NumThefts	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
TotalNumMurals	<b>40.50179</b>	<b>22.87596</b>	<b>1.77</b>	<b>0.083</b>	<b>-5.518698</b>	<b>86.52228</b>
TotalSIG	<b>.001667</b>	<b>.0007994</b>	<b>2.09</b>	<b>0.042</b>	<b>.0000589</b>	<b>.0032751</b>
_cons	<b>2060.305</b>	<b>108.2091</b>	<b>19.04</b>	<b>0.000</b>	<b>1842.617</b>	<b>2277.994</b>

**Figure 6. Effect of Murals on Thefts Regression Results**

These results showcase that total number of murals is slightly less significantly correlated with the total number of thefts. At a 95% confidence level, TotalNumMurals is not significantly correlated with NumThefts, but the relationship is significant at a 90% confidence level.



Meanwhile, the total amount of storefront-improvement-grants is significantly correlated with the total number of thefts, at a 95% confidence level.

## **Chapter 4**

### **Discussion**

#### **Limitations**

Much of the art seen on the streets of Philadelphia is casually made, and not publicly installed. Therefore, there is a possibility that these other art pieces could influence the outcome variables in this research. However, the Philadelphia Mural Arts provides clearly listed locations and dates of installation for art pieces. For simplicity, in this study, I studied only the public murals in this program that had clear locations and dates of installation.

In addition, due to the unequal sizes of Philadelphia neighborhoods, this research could be improved by equalizing the sizes of areas studied. In future research, someone could analyze this data based on equal-size areas, perhaps encompassing a radial distance from each particular art installation.

There were also limitations regarding the data collection. The data for the storefront-improvement-grants only spanned from the year 2008 to 2015. Because I wanted to use this dataset, to account for differences in business investment among each neighborhood, I was limited to studying within this timeframe.

## **Conclusion**

In this research, I found significant relationships between total number of murals and number of homicides, as well as total number of murals and number of thefts, at 95% and 90% confidence levels, respectively. These results are potentially promising—however, they are tempered by the limitations of this research. With those factors in mind, I would encourage further study on the potential relationship between levels of public art and crime rates.

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## ACADEMIC VITA

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*English Teaching Volunteer* Summer 2017  
Learning Enterprises Non-profit Organization Jiangsu, China

- Collaborated with Nanjing University student to manage a classroom of 20+ children, aged 8-12
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*Summer Camp Counselor* Summer 2013 – Summer 2014  
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- Managed a group of 10+ children, aged 6-8 for 6 weeks
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