

**OF DEATH AND DYING: A SPATIAL ANALYSIS OF RACE,
NEIGHBORHOOD DISTRESS, AND SUICIDE IN PITTSBURGH**

by

Karl Gibson

BPhil in Sociology, University of Pittsburgh, 2016

BS in Natural Science, University of Pittsburgh, 2016

BS in Psychology, University of Pittsburgh, 2016

Submitted to the Faculty of
the University Honors College in partial fulfillment
of the requirements for the degree of
Bachelor of Philosophy

University of Pittsburgh

2016

UNIVERSITY OF PITTSBURGH
UNIVERSITY HONORS COLLEGE

This thesis was presented

by

Karl Gibson

It was defended on

January 29, 2016

and approved by

Douglas Maynard, Ph.D, University of Wisconsin, Department of Sociology

Daniel Romesberg, Ph.D, University of Pittsburgh, Department of Sociology

Anita Zuberi, Ph.D, University of Pittsburgh, Department of Social Work

Thesis Advisor: Waverly Duck, Ph.D, University of Pittsburgh, Department of Sociology

Copyright © by Karl Gibson

2016

**OF DEATH AND DYING: A SPATIAL ANALYSIS OF RACE,
NEIGHBORHOOD DISTRESS, AND SUICIDE IN PITTSBURGH**

Karl Gibson, BPhil

University of Pittsburgh, 2016

Suicide is one of the leading causes of death in the United States. This article examines the relationship between multiple levels of neighborhood distress, race, and suicide in the city of Pittsburgh, Pennsylvania. Using data from the Census as well as the Pittsburgh Neighborhood and Community Information System (PNCIS), this study investigates the relationship between racial disparities, neighborhood socioeconomic disadvantage (SED), residential instability, violence, and suicide in Pittsburgh's residential neighborhoods. Ordinary least squares (OLS) linear regression was used to model the data, regressing race, SED, residential instability, and violent crime on suicide rates. Findings suggest that SED is positively associated with suicide rates at the neighborhood level, as is having a low percentage of Black residents. Furthermore, the percentage of Black residents is found to be a stronger predictive factor than SED, despite black neighborhoods exhibiting the highest levels of distress. Implications of these findings for future research are discussed.

TABLE OF CONTENTS

PREFACE.....	ix
1.0 INTRODUCTION.....	1
1.1 LITERATURE REVIEW.....	1
1.1.1 Durkheim and a Brief History of Sociological Studies of Suicide.....	1
1.1.2 The Role of Socioeconomic Status and Neighborhood Distress in Suicide...	3
1.1.3 The Racial Disparities in Socioeconomic Status and Suicide.....	4
1.1.4 Community Instability.....	5
1.1.5 Violent Crime and Suicide.....	6
1.2 STUDY CONTRIBUTIONS AND CONTEXT.....	7
1.2.1 Study Contributions.....	7
1.2.2 Context of the Study.....	7
2.0 DATA AND METHODS.....	8
2.1 VARIABLES.....	8
2.1.1 Suicide.....	9
2.1.2 Socioeconomic Disadvantage Index.....	9
2.1.3 Residential Instability Index.....	9
2.1.4 Violent Crime.....	10
2.1.5 Race.....	10
2.2 STATISTICAL ANALYSES.....	10
2.3 REMOVAL OF OUTLIERS.....	11
3.0 RESULTS.....	13
3.1 SAMPLE DESCRIPTIVE STATISTICS.....	13
3.2 UNDERSTANDING THE MAIN VARIABLES: THE DISTRIBUTION OF VARIABLES ACCORDING TO NEIGHBORHOOD RACIAL MAKEUP.....	16
3.2.1 Suicide.....	18
3.2.2 Socioeconomic Disadvantage Index.....	18
3.2.3 Residential Instability Index.....	18
3.2.4 Violent Crime.....	19
3.3 HYPOTHESES TESTING: EXAMINING SUICIDE, RACE, AND DISTRESS.....	19
4.0 DISCUSSION.....	24
4.1 LIMITATIONS.....	27

5.0 CONCLUSION.....	28
BIBLIOGRAPHY.....	29

LIST OF TABLES

Table 1. Sample Statistics.....	14
Table 2. Distribution of Variables by Neighborhood Racial Composition.....	17
Table 3. Regression for Suicide on Race, SES Distress, Percent Tenure, Percent Population Change, and Average Violence.....	21
Table 4. Regression for Suicide on Three Interaction Models.....	23

LIST OF FIGURES

Figure 1. Neighborhood Map of Pittsburgh Displaying Percent Suicide Relative to
Neighborhood Population..... 15

PREFACE

I would like to thank all of my faculty, colleagues, and friends at the University of Pittsburgh who aided my pursuit of this research project. First, I would like to express special thanks to my thesis advisor, Waverly Duck, who helped me formulate my thesis, offered me guidance with this project, and addressed my countless questions as the project progressed. I would like to thank Anita Zuberi, who provided invaluable and extensive help regarding the statistics of my project as well as its formatting, and Melanie Hughes, who allowed me to audit her graduate course on quantitative methods in order to learn how to use and interpret the statistics necessary to complete my project. I would also like to thank the University Honors College for funding my research through the Brackenridge Summer Research Fellowship. Lastly, I would like to thank my family and friends for their multiple years of support while I completed this project.

1.0 INTRODUCTION

1.1 LITERATURE REVIEW

Suicide was found to be the tenth leading cause of death for all age ranges in the United States in 2010, with a total of 38,364 suicides occurring over the course of the year for an average of 105 suicides per day. Furthermore, suicide was estimated to result in 34.6 billion dollars in medical and work loss costs every year (Centers for Disease Control and Prevention, 2010).

Socioeconomic status (SES) can influence suicide rates hindering social integration of individuals in a community as well as hindering access to mental health services (Denney, Rogers, Krueger, & Wadsworth, 2010). While socioeconomic status can have as great an impact on suicide rates as mental disorders, studying its influence is critical to understanding suicide rates of populations (Page, Taylor, Hall, & Carter, 2009). The importance of assessing protective and risk factors associated with suicide cannot be understated.

1.1.1 Durkheim and a Brief History of Sociological Studies of Suicide

Durkheim was one of the first researchers to investigate the influence of social factors on suicide. In Durkheim's classic work, *Suicide*, his primary objective was to explain and analyze a largely individual behavior (suicide) as a social phenomenon (Durkheim, 1897/1951). Durkheim stated:

If, instead of seeing in them only separate occurrences, unrelated and to be separately studied, the suicides committed in a given society during a given period of time are taken

as a whole, it appears that this total is not simply a sum of independent units, a collective total, but is itself a new fact *sui generis*, with its own unity, individuality and consequently its own nature - a nature, furthermore, dominantly social (Durkheim, 1897/1951 p. 46)

What was unique about Durkheim's perspective, was that he viewed suicide rates as a social fact, maintaining that it had a social identity that was not entirely individual in nature. Many sociological studies of suicide are built upon Durkheim's central argument that suicide can be analyzed as a social incident, and not solely an individual act (Abrutyn & Mueller, 2014; Condorelli, 2013). Durkheim examined a number of factors to understand differing suicide rates, including religion, marital status, and the social organization of the economy. Using this approach, Durkheim found that social ties and social integration are inversely related to suicide rates within a society.

Whereas most of the existing literature investigates suicide at an individual-level, this paper seeks to expand research in this field by investigating neighborhood-level data. Certain community-level variables, such as residential instability, are better examined at the neighborhood-level than the individual-level, otherwise neighborhood-level effects can be missed. Community-level structure has an important influence over health outcomes, which cannot be reduced to the individual-level effects. In keeping with Durkheim's logic, this study seeks to explore the significance of neighborhood distress - conceptualized as race, economy, place, and social ties - for suicide rates in the city of Pittsburgh. Using a neighborhood-level approach provides public health officials with possible avenues for combating higher suicide rates in particular neighborhoods by identifying those that are at a higher risk for suicide.

1.1.2 The Role of Socioeconomic Status and Neighborhood Distress in Suicide

Suicide risk has been linked to multiple aspects of socioeconomic disadvantage (SED), including unemployment and lower social class (Purselle, Heninger, Hanzlick, & Garlow, 2009). SED can be conceptualized in terms of structural factors (such as poverty, unemployment, and lack of education) that can cause disadvantages for individuals and populations. Low socioeconomic status can be seen as a symptom of neighborhood distress. In a study analyzing the rising trend in suicide rates from 1970 to 1985 in Ireland, suicide was found to be associated with socioeconomic status, and importantly, suicide rates were found to increase as unemployment rates increased, particularly among males (Kelleher & Daly, 1990). Additionally, a study of suicides in Denmark from 1981-1997 found that economic stressors, such as low income and unemployment, increased suicide risk for individuals, particularly in males (Qin, Agerbo, & Mortensen, 2003). Furthermore, Lewis and Sloggett (1998) found a strong correlation between higher unemployment rates and increased suicide rates when analyzing 1981 Census data from England and Wales.

In general, prior research findings suggest that lower income and higher unemployment rates are associated with higher rates of suicide in White populations (Johansson & Sundquist, 1997; Purselle et al., 2009). However, measures of socioeconomic status seem to be limited in scope, with many studies focusing only on income, excluding other important measures of disadvantage, such as unemployment or level of education. Moreover, most studies in the suicide literature focus on individual-level data, neglecting how the socioeconomic status of the neighborhood as a whole can influence suicide. When the entire population of a neighborhood exhibits low socioeconomic status, it might be harder for neighbors to aid each other or provide

social support. This, in turn, could lead to higher incidence of suicide in the neighborhood. In the present study, SED is hypothesized to predict an increase in the incidence of suicide within a community.

1.1.3 The Racial Disparities in Socioeconomic Status and Suicide

Traditionally, Black populations have exhibited lower suicide rates than white populations, despite Black populations' historical experience of racial discrimination, high levels of persistent poverty, and social isolation due to residential segregation in the United States. Over the past few decades, the disparity in suicide rates between these two groups has lessened (Stack, 2000a; Gibbs, 1997). Race has been found to play a crucial role in how income influences suicide rates, somewhat complicating the impact of socioeconomic status. For example, Purselle & al., (2009) found that areas with income lower than the general population had more suicide victims living within the area. However, the difference appeared to be almost exclusively among White suicide victims who resided in areas where the average income was only 70% of the general White population. In Black populations, suicide victims had slightly higher incomes than their White counterparts, though the researchers note that the difference in income for Black populations was likely not meaningful. Nonetheless, Steenland, Halperin, Hu & Walker (2002) reported that as the income of a population increases, there is a significant decrease in the suicide rates of White populations, yet the decrease in suicide rates of Black populations was much less pronounced for the same unit increase in population income.

In addition to income, other measures of socioeconomic status have been examined: the effects of levels of education and high school dropout rates on suicide. Joe, Baser, Breeden, Neighbors & Jackson (2006) note that both the risk of suicidal ideation and the risk of attempting

suicide for African Americans were associated with having a low education level. In particular, African Americans with less than a high school education had a much greater likelihood of attempting suicide (Joe et al., 2006; see also Willis, Coombs, Drentea, & Cockerham, 2003).

Although Black populations exhibit lower average rates of suicide than White populations, findings regarding the effects of income and unemployment on the suicide rate of Black populations seem to be mixed. Furthermore, many studies investigating suicide on an individual-level provided inconclusive data on the number of Black victims, leading to difficulties detecting statistically significant racial differences with regard to risk factors such as SED, or other racial differences related to risk factors for suicide (Purselle et al., 2009). However, because Black neighborhoods historically exhibit the lowest suicide rates, while being the most socioeconomically disadvantaged, it has been difficult to predict the impact of SED on these neighborhoods. The present study addresses these matters: in addition to examining the relationship between race and suicide, it also examines the relationship of race to SED, with the aim of detecting possible moderation effects whereby race offers a protective buffer against living in disadvantaged neighborhoods.

1.1.4 Community Instability

Community instability can be defined as a neighborhood that is experiencing low rates of home ownership and decreased numbers of residents who have occupied the same home for the past five years. In this study, neighborhood instability will be examined as a measure of neighborhood distress. Johansson and Sundquist (1997) found that communities experiencing high turnover also experienced higher rates of psychiatric disorders, including a higher incidence of suicide. However, this finding was completed at a nationwide-level, ignoring possible

neighborhood level effects. Furthermore, Coleman (1990) found that high levels of residential turnover led to a disruption of continuity within a community, hindering the development of new social ties and damaging existing social ties. Thus, an abrupt population change could destabilize and negatively influence the social organization and network of a community, leading to distress for the neighborhood residents. However, prior literature is limited and does not focus on investigating how residential instability could impact suicide rates across neighborhoods. For the present study, it is hypothesized that high levels of residential instability will be predictive of higher rates of suicide.

1.1.5 Violent Crime and Suicide

Violent crime is an offense involving murder, robbery, rape, or aggravated assault.

Neighborhoods that are highly distressed tend to show high levels of violent crime (Sampson, Raudenbush & Earls, 1997). As higher levels of distress within neighborhoods are related to higher rates of violent crime, these sustained stressors can make residents more vulnerable to disease and stress-related behaviors. This could, in turn, affect the number of suicides within a given neighborhood. In addition, Cornaglia, Feldman, and Leigh (2013) found that higher violent crime rates were correlated with adverse mental health outcomes for both victims and non-victims alike. However, prior literature has not investigated the impact of violent crime on suicide. In the present study, it is hypothesized that violent crime, an indicator of neighborhood distress and poor mental health outcomes, acts as a stressor, predicting higher rates of suicide for neighborhood residents.

1.2 STUDY CONTRIBUTIONS AND CONTEXT

1.2.1 Study Contributions

The goal of this paper is to take a nuanced look at the relationship between race, multiple measures of neighborhood distress (SED, residential instability, and violent crimes), and their influence on suicide rates. It is hypothesized that, as neighborhood distress—measured as SED, residential instability, and rates of violent crime—increase, so will suicide rates. A second hypothesis is that predominantly Black neighborhoods will have lower suicide rates than White neighborhoods. Finally, given evidence that black populations have, on average, lower suicide rates than white populations, this paper will examine whether race moderates the effect of neighborhood distress on suicide. Since historically black neighborhoods exhibited high levels of concentrated neighborhood distress, this topic has not been previously explored.

1.2.2 Context of the Study

Using multiple measures of neighborhood distress, this exploratory study of suicide will analyze variations of suicide rates across neighborhoods in Pittsburgh, along with the factors that produce these variations. With respect to race, Pittsburgh offers a unique situation in which the population is predominantly White and Black, allowing for a more or less binary comparison of the two groups (67% White and 27% Black based on the 2000 census). As with many large former industrial cities, Pittsburgh is highly segregated along race and class lines. Several studies show that racial segregation and social isolation have produced greater neighborhood poverty for Blacks than Whites (Massey & Eggers, 1990; O'hare & Mather, 2003; Wallace et al., 2013). This paper investigates the intersection of race and SED as they affect suicide in White and Black populations.

2.0 DATA AND METHODS

2.1 VARIABLES

This study used Census data as well as other measures of local-level data from the Pittsburgh Neighborhood and Community Information System (PNCIS) in order to ascertain the relationship between suicide rates, various measures of neighborhood distress, and race. The PNCIS gathers data from various local entities (including the health department, police reports, and other administrative data sources) on the 90 official neighborhoods located in the city of Pittsburgh. While the study investigated all 90 neighborhoods in the Pittsburgh area, it retained only 85 of the neighborhoods for statistical analysis due to outlier effects: two neighborhoods had population sizes too small for analysis, and the other three neighborhoods were removed as outliers based on leverage, externalized studentized residuals, and overall influence (Cook's D and DFFITS). These neighborhoods were defined using the census tract boundaries, as demarcated in the 2000 Census.

2.1.1 Suicide

The suicide data was determined using death records occurring among residents in the city of Pittsburgh from 2006-2010. The number of suicides was aggregated over this time span, providing a total number of suicides for a given neighborhood from 2006-2010. Only completed suicides were included in this aggregate number. The suicide rate was calculated as a percentage of the total population using the 2000 Census data

2.1.2 Socioeconomic Disadvantage Index

The SED index was calculated using the 2000 Census data. To create this index, the percentages of poverty, unemployment, high school dropouts, and single-mother households per individual neighborhood were combined into one variable (Cronbach's alpha was .83). Using the principal component factor analysis option in statistical analysis software (SAS), the standardized component was used to weight each variable and subsequently combine these weighted variables into a single index variable.

2.1.3 Residential Instability Index

Residential instability was measured using resident tenure and the percentage of the population that resided in the same home for the past five years. Tenure was calculated as the percent of housing units in the neighborhood that were occupied from the 2000 Census. The residential instability index combined these two variables into one variable (Cronbach's alpha was .85). Using the principal component factor analysis option in SAS, the standardized component was used to weight each variable and subsequently combine these weighted variables into a single index variable.

2.1.4 Violent Crime

Violent crime was calculated using police record data from the PNCIS (the Pittsburgh Neighborhood and Community Information System). All incidents of violent crime were collected, and a yearly average was calculated for each neighborhood. In accordance with the Uniform Crime Reporting System (UCRS), which was established by the Federal Bureau of Investigation (FBI), all crime data within the PNCIS system includes twenty-nine different classifications arranged into hierarchies. Violent crime was defined using hierarchies 1-4, which include aggravated assault, robbery, rape, and murder. The years of data collection range from 2005 to 2010. Violent crime was estimated as a percentage per 1,000 people using the 2000 Census population data.

2.1.5 Race

Race was calculated using the percent Black of various neighborhoods in the 2000 Census. The percent Black is the percentage of the neighborhood population that identifies as Black. Since approximately 95 percent of the population in Pittsburgh is either White or Black (67% white and 27% Black based on the 2000 census), these two races were the focus of this study. Furthermore, like many other urban areas, Pittsburgh is highly racially segregated, with most neighborhoods having either White or Black residents.

2.2 STATISTICAL ANALYSES

Ordinary least squares (OLS) linear regression was used to model the data, regressing race, SED, residential instability, and violent crime on suicide rates in order to test the various hypotheses. The effects of living in a socioeconomically disadvantaged neighborhood are hypothesized to

predict an increase in the incidence of suicide within a community. Furthermore, neighborhoods with high levels of residential instability were hypothesized to experience higher suicide rates. Lastly, violent crime, an indicator of neighborhood distress and poor mental health outcomes, was hypothesized to act as a stressor, predicting higher rates of suicide for neighborhood residents. Recall that, while Black populations exhibit lower average rates of suicide than White populations, findings regarding the effects of SED on Black populations seem to be mixed. Therefore, three additional moderation effects were examined. The first was the moderation effect of race on SED and suicide, the second was the moderation effect of race on residential instability and suicide, and the last was the moderation effect of race on violent crime and suicide.

2.3 REMOVAL OF OUTLIERS

The possible influence of outliers was examined through regression and running subsequent models to test for robustness. Six methods were used to identify possible cut points: Leverage, R Student, Cook's D, Dffits, CovRatio, and DFBetas (Bollen & Jackman 1990; Chatterjee & Hadi, 1986). To determine a cut point for Leverage, the equation $\frac{2(k+1)}{n}$ was used, yielding a value of 0.16. However, due to the small sample size, a more permissive value of 0.30 was used to identify the most influential outliers. R Student has a standard recommended cut point of greater than 2 or less than -2. Using both of these cutoffs, four neighborhoods were identified as possible outliers. For Cook's D, the equation $4(n - k - 1)$ was used. This yielded a value of 0.049, identifying five neighborhoods as possible outliers. For Dffits, observations with values greater than 1, or less than -1, were identified as outliers. Dffits identified three neighborhoods as possible outliers. For CovRatio, any significant variation from 1 is viewed as an outlier. Based

on the suggested identification point of 1, any value less than 0.4 or greater than 1.6 was identified as a potential outlier. Lastly, DFBetas have a similar cut point to Dffits, where any value greater than 1 or less than -1 was identified as a possible outlier. Taking all of these tests into consideration, three neighborhoods were removed as outliers. In addition to these three neighborhoods, two additional neighborhoods were removed due to population size, as their population sizes were less than 60 residents. The removal of outliers improved the strength of the model, however all patterns were observable in the data without the removal of outliers.

3.0 RESULTS

3.1 SAMPLE DESCRIPTIVE STATISTICS

The results indicated that rates of suicide vary across neighborhoods in Pittsburgh (see Table 1). During the time period from 2006-2010, the number of suicides per neighborhood varied from 0 to 7, with an average of 1.88 suicides per neighborhood. The average percentage of suicides across the neighborhoods was less than 1 percent (0.048%), with the percentage of suicides not being evenly distributed among the various neighborhoods but appearing to cluster in certain areas (see Figure 1). Along with suicide, neighborhood SED varied greatly across the neighborhoods that make up the city limits of Pittsburgh, with an average SED index of -0.005. Variables contributing to the disadvantage index (median income, percent unemployment, percent high school dropout, and percent single-mother households) also varied greatly across the various neighborhoods. The average residential instability index value for neighborhoods was 0.042. Student dorms and housing as well as public housing may have contributed to the low tenure rates in a few neighborhoods, resulting in a higher residential instability index value. Lastly, the median number of violent crimes per 1,000 people was 11.67.

Table 1. Sample Statistics

Variables	Source	Mean	SD	Minimum	Maximum
Percent Suicide (%)	PNCIS	0.05	0.04	0.00	0.22
Percent Black (%)	Census	36.02	34.08	0.20	97.00
SED Index	Census	0.00	0.65	-0.99	2.32
Residential Instability	Census	0.04	0.85	-2.60	1.57
Average Violence (Per 1000 Residents)	PNCIS	16.27	18.27	0.15	137.80

Note. The Census data came from the 2000 Census tract averages. Pittsburgh Neighborhood and Community Information System (PNCIS) data came from various sources (Percent Suicide 2006-2010; Violent Crime 2005-2010).

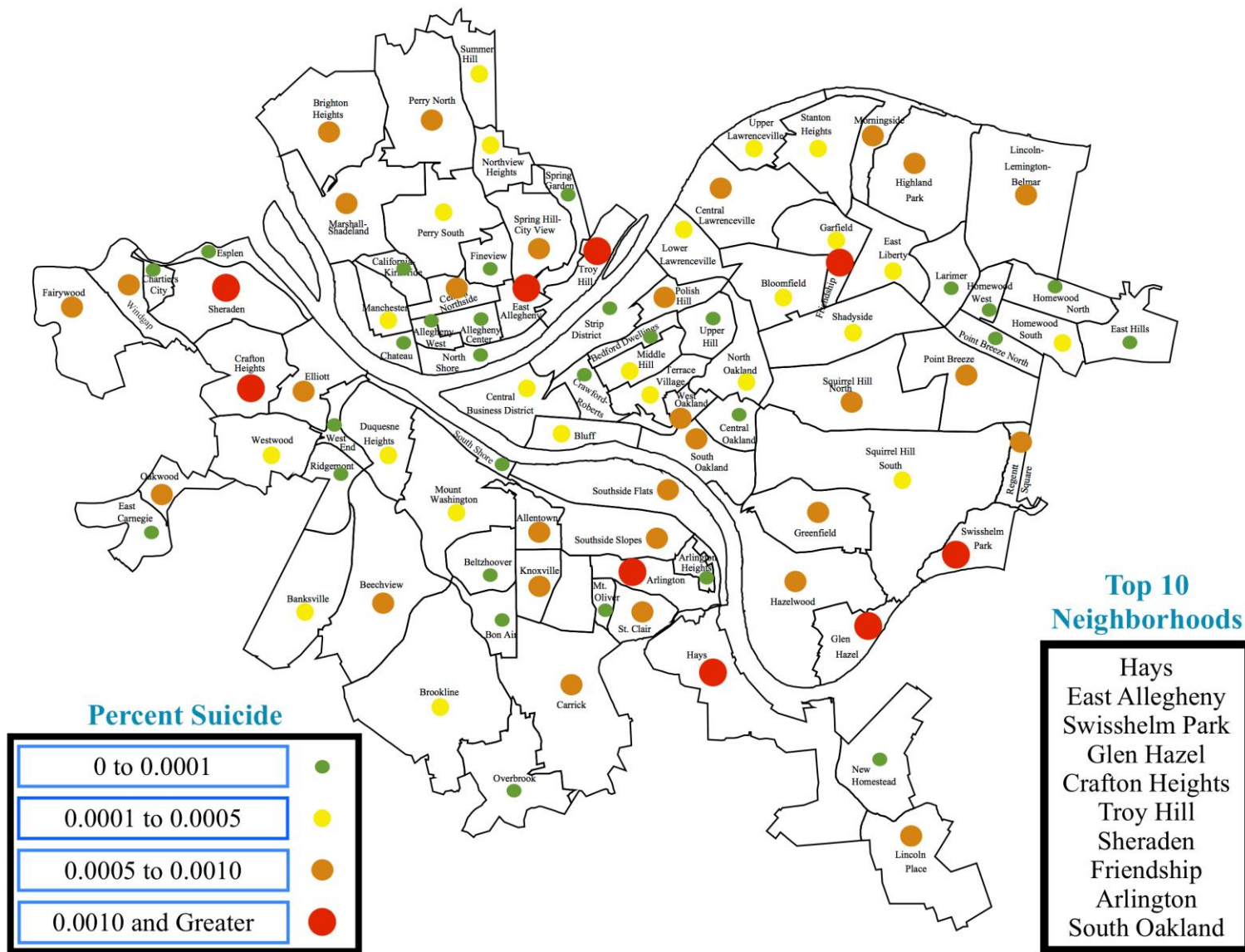


Figure 1. Neighborhood Map of Pittsburgh Displaying Percent Suicide Relative to Neighborhood Population

3.2 UNDERSTANDING THE MAIN VARIABLES: THE DISTRIBUTION OF VARIABLES ACCORDING TO NEIGHBORHOOD RACIAL MAKEUP

In the city of Pittsburgh, approximately 95% of the population is White or Black. However, Pittsburgh is a fairly segregated city. In the sample population, the minimum percent of the population that was Black in a neighborhood was less than 1 percent (0.20%), while the maximum percent Black was 97%. Of the neighborhoods examined ($N = 85$), 46 (or 54%) neighborhoods had less than 25% of the population identifying as Black; 12 (14%) had between 25% and 50% of the population identifying as Black; and 27 (32%) had greater than 50% of their population identifying as Black. In other words, approximately half of the neighborhoods examined were predominantly White, while approximately a third of the neighborhoods were predominantly Black. In contrast, very few neighborhoods fell into the racially mixed category.

Furthermore, the variables examined were not evenly distributed across the different racial categorizations of neighborhoods (see Table 2). Because of this phenomenon, a series of Kruskal-Wallis Tests were used to confirm that the observed differences across the groups (White neighborhoods, mixed neighborhoods, and Black neighborhoods) were statistically significant.

Table 2. *Distribution of Variables by Neighborhood Racial Composition*

Variables	White (N=46)		Mixed (N=12)		Black (N=27)	
	Mean	SD	Mean	SD	Mean	SD
Percent Suicide (%)	0.06	0.05	0.05	0.04	0.03	0.04
SED Index	0.08	0.03	0.11	0.04	0.17	0.07
Residential Instability Index	0.27	0.89	-0.19	0.99	-0.25	0.63
Average Violence (Per 1000 Residents)	9.59	9.50	16.46	11.50	27.53	11.50

Note. Neighborhoods were categorized into three categories: White (less than 25%), mixed (less than 50 percent but greater than 25 percent Black), and Black (greater than 50 percent). This categorization was used by Zuberi, Duck, Gradeck, and Hopkinson (2015).

3.2.1 Suicide

White neighborhoods were found to have the highest average suicide rates ($M = 0.059$, $SD = 0.050$), while Black neighborhoods had the lowest rates ($M = 0.029$, $SD = 0.035$). Moreover, Black neighborhoods appear to have much lower suicide rates than either White or mixed neighborhoods, with mixed and White neighborhoods showing similar trends. The results of a Kruskal-Wallis Test confirm that there was a statistically significant difference across the three neighborhood categories ($\chi^2(2, N = 85) = 7.43$, $p = .024$).

3.2.2 Socioeconomic Disadvantage Index

SED increases as the percentage of Black residents in a neighborhood increases. Compared to White neighborhoods' average SED ($M = 0.078$, $SD = 0.033$), that of Black neighborhoods ($M = 0.17$, $SD = 0.068$) is approximately 10% higher. This trend indicates that neighborhoods that are mostly composed of Black residents are exposed to higher rates of disadvantage and poverty. Black neighborhoods had an average of 36% of their residents living in poverty, while mixed neighborhoods averaged 22%, and White neighborhoods averaged 16%. The results of a Kruskal-Wallis Test confirmed that there was a statistically significant difference across the three neighborhood categories for SED ($\chi^2(2, N = 85) = 38.52$, $p < .0001$).

3.2.3 Residential Instability Index

Residential instability also varied across neighborhood racial categories. In particular, instability became progressively more negative (i.e. more unstable) as the percentage of Black individuals in the neighborhood increased. The average residential instability index value for White neighborhoods ($M = 0.272$, $SD = 0.877$) was higher than that for Black neighborhoods ($M = -$

0.248, $SD = 0.630$). The results of a Kruskal-Wallis Test confirmed that there was a statistically significant difference across the three neighborhood categories ($\chi^2(2, N = 85) = 11.76, p = .003$).

3.2.4 Violent Crime

The average number of violent crimes committed per 1,000 residents was highest in Black neighborhoods ($M = 27.53, SD = 11.50$). The lowest average number of crimes occurred in White neighborhoods ($M = 9.59, SD = 9.50$). This was a difference of approximately 17.00 crimes per 1,000 residents. The results of a Kruskal-Wallis Test confirmed that there was a statistically significant difference across the three neighborhood categories ($\chi^2(2, N = 85) = 27.40, p < .0001$).

3.3 HYPOTHESIS TESTING: EXAMINING SUICIDE, RACE, AND DISTRESS

Table 3 presents the results of a regression model including percent Black, SED, percent tenure, percent population change, and average number of violent acts as independent measures, and percent suicide as the outcome variable, for 85 Pittsburgh Neighborhoods. The results of this model suggest that both race ($p < .002$ and SED ($p < .024$) are statistically significant factors. For every additional percent of Black population in the neighborhood, the average percent of suicide decreases by 0.068 ($SE = 0.021$), controlling for all other measures in the model. Further, for every unit increase in SED, the suicide percent relative to population increases by 0.000276 ($SE = 0.000120$), again controlling for all other measures in the model. The largest effect is the percent Black (producing a -0.50 standard deviation change in the percent suicide). Although SED still produces a robust effect, it is not as strong as percent Black (producing a 0.39 standard

deviation change in the percent suicide). Residential instability and average violent acts were not found to be statistically significant. Overall, about 11% of the variability in percent suicide can be explained by the factors explored in this model.

Table 3. Regression for Suicide on Race, SES Distress, Percent Tenure, Percent Population Change, and Average Violence

Variables	Percent Suicide	
	b (SE)	β
Percent Black (%)	-6.83×10 ⁻² *** 2.13×10 ⁻²	-0.5
SED Index	2.76×10 ⁻⁴ ** 1.20	0.39
Residential Instability Index	6.23×10 ⁻⁵ 6.34×10 ⁻⁵	0.11
Average Violence (Per 1000 Residents)	2.82×10 ⁻⁶ 3.17×10 ⁻⁶	-0.11
Intercept	7.76×10 ⁻⁴	
Adjusted R2	0.11	
N	85	

*p<0.10, **p<0.05, ***p<0.01 (two-tailed test).

Additionally, three moderation effects were tested. None of the three moderation effects were found to be significant (see Table 4). The first model investigated whether race moderated the effect of SED on suicide, and was not found to be significant ($p > .05$). The second model investigated whether race moderated the effect of residential instability on suicide, and was not found to be significant ($p > .05$). Lastly, the third model tested whether race moderated the effect of average number of violent crimes on suicide, and was not found to be significant ($p > .05$). In summary, none of the moderation effects were found to be significant.

Table 4. Regression for Suicide on Three Interaction Models

Percent Suicide						
Variables	Model 1		Model 2		Model 3	
	b (SE)	β	b (SE)	β	b (SE)	β
Percent Black (%)	$-4.49 \times 10^{-2} **$ 2.00×10^{-2}	-0.33	$-6.33 \times 10^{-2} ***$ 2.04×10^{-2}	0.47	$-3.97 \times 10^{-2} ***$ 1.45×10^{-2}	-0.30
SED Index			1.29×10^{-4} 1.77×10^{-4}	0.18		
Residential Instability Index					1.09×10^{-4} 7.52×10^{-5}	0.20
Average Violence (Per 1000 Residents)	-6.40×10^{-6} 6.99×10^{-6}	-0.25				
Intercept	6.78×10^{-4}		6.94×10^{-4}		6.01×10^{-4}	
Race/Average Violence Interaction	7.41×10^{-6} 9.57×10^{-6}	0.25				
Race/SED Interaction			7.29×10^{-5} 2.36×10^{-4}	0.07		
Race/Residential Instability Interaction					-2.66×10^{-4} 1.89×10^{-4}	-0.20
Adjusted R²	0.06		0.08		0.08	
N	85		85		85	

*p<0.10, **p<0.05, ***p<0.01 (two-tailed test).

4.0 DISCUSSION

The goal of this exploratory study was to investigate the relationship between neighborhood distress and suicide rates in Pittsburgh's residential neighborhoods. Applying Durkheim's classic theoretical argument to a contemporary example, this study investigated neighborhood-level data, as opposed to individual-level measures, to gain a more nuanced understanding of how race, suicide, and neighborhood distress are interrelated.

The first hypothesis examined the relationship between neighborhood SED and percent suicide relative to population. It was predicted that, even after controlling for race, the effects of socioeconomically disadvantage within a neighborhood (e.g. a higher incidence of poverty, higher single-mother families, high unemployment rates, and high school dropout rates) would increase the suicide rate of the neighborhood. The second hypothesis predicted that with a high index of residential instability, there would be less access to social capital, leading to weakened social ties within the neighborhood, which would, in turn, increase the percent of suicides. The third hypothesis predicted that a higher incidence of violent crimes would lead to increased rates of suicide. The results of OLS regression supported the hypothesis that socioeconomically disadvantaged neighborhoods were predictive of higher suicide rates, but did not support the hypotheses related to either of the other two measures of neighborhood distress.

As Durkheim's theory of social integration suggests, when a neighborhood is highly disadvantaged, it is more difficult to maintain the social ties that provide a protective effect against suicide for individuals within the neighborhood. Additionally, it is possible that high

levels of SED in a community can lower collective efficacy - defined as the ability of a social network, within a given space, to pursue a common purpose and goal (Sampson, Raudenbush & Earls, 1997) - further strengthening the social ties within the community. However, residential instability and average incidence of violent crimes were not found to be predictive of a higher incidence of suicide. Upon examination of the ten neighborhoods with the highest suicide rates, none were found to have population changes that differed significantly from the mean.

Specifically, six of the neighborhoods had higher percent tenured homes than the mean, while four were below the mean. Additionally, only two of the ten neighborhoods with the highest suicide rates had numbers of violent crimes above the median number for violent crimes.

The results of OLS regression supported the hypothesis that, as the percent of the population that was Black increased, the percent of suicides would decrease. When comparing the standardized coefficients for race and SED, race actually has a larger influence on suicide than does SED. Accordingly, despite the higher rates of disadvantage in Black neighborhoods, other factors must be at work strengthening ties among residents, providing a protective effect for these spaces. Additionally, cultural differences exist in Black neighborhoods that could aid in explaining these findings. Historically, extended familial networks and kinship networks have played a major role in the ability of African Americans to survive despite living in a hostile and discriminatory society (Gibbs, 1997; Billingsley, 1992). The extended familial networks that have developed in these Black neighborhoods provide functions such as social support, emotional support, and economic support for their inhabitants (Gibbs). Therefore, the extended family networks may provide a necessary protective buffer for individuals in these communities. In addition to extended familial networks, the importance of religion within Black communities may also help explain the findings. By fostering commitment to particular life-preserving values,

beliefs, and practices, religiosity has been found to act as a suicide deterrent based on social integration within the community (Stack, 2000b; Billingsley; Early, 1992; Stack, 1983; Stark, Doyle, & Rushing, 1983).

Despite exhibiting the lowest suicide rates, Black neighborhoods also exhibit some of the highest levels of disadvantage in Pittsburgh (see Table 2). On average, Black neighborhoods exhibited the highest levels of SED, residential instability, and average incidence of violent crimes. Because of this phenomenon, models were run to examine whether there was a moderation effect between the various measures of neighborhood distress and race. None of the moderation effects that were tested were supported by the regression model (see Table 4).

Research examined interactions and order within poor Black neighborhoods (Duck, 2015; Duck and Rawls, 2012). Although the Black neighborhoods appear disordered and chaotic to outsiders, Duck found that activities within poor Black neighborhoods, such as drug dealing, also reflect a sense of order in these communities, as they show a local code of conduct. Thus, many apparent signs of decay, such as drug dealing, violence, and vacant lots, should not necessarily be viewed as signs of disorder per se.

Together, these findings suggest that SED plays an important role in increasing the incidence of suicide within neighborhoods, even after accounting for race. They also contribute to the literature by showing both the importance of using multiple measures for examining SED, as well as demonstrating the influence of this distress at a neighborhood-level rather than an individual-level. In addition, the findings of this study contribute to the literature by demonstrating the relative strengths of the two significant variables (race and SED), with race exhibiting a stronger effect on suicide than even SED. However, other variables of interest were not found to be significant, and the moderation effects were not found to be significant. Future

research is indicated to investigate how other measures of distress and disinvestment in a community influence suicide rates, as well as to unpack what features are unique to Black neighborhoods that combat the effects of concentrated poverty and distress.

4.1 LIMITATIONS

The primary limitation of the present study was that data on aggregate numbers of suicides were only available over a four-year span. A longer period of analysis may have found trends in the data that the present study was unable to illustrate. Another limitation of the study related to time ordering of the data used for analysis. Because data was collected from multiple sources, such as PNCIS and the Census, the measures were not always available for the same period of time. Nonetheless, this study demonstrated that neighborhood data is a valuable tool for understanding and examining suicide. Neighborhood-level findings could be useful for public health officials as a possible avenue for combating higher rates of suicide by identifying and implementing policy changes for neighborhoods that are at risk for higher rates of suicide.

5.0 CONCLUSION

The present study investigated the relationship between multiple measures of neighborhood distress and suicide rates in Pittsburgh. Consequently, it provides a more nuanced understanding of the relationship between race, suicide, and neighborhood distress. Despite Black neighborhoods exhibiting the highest levels of distress, they displayed the lowest rates of suicide and were found to be a stronger predictive factor of suicide rates than neighborhood SED, suggesting the presence of a protective factor within these spaces. These findings suggest important avenues for future research. Such research could seek to better examine measures of community stability by analyzing the average length of time an individual has resided in a neighborhood, as well as the relative flow of individuals entering and exiting the neighborhood. Additionally, future research should further examine the protective effect that Black neighborhoods have against suicide, elucidating which neighborhood characteristics might provide this effect. Finally, the present study has highlighted the effects of SED on suicide, which future research could further specify by utilizing other measures of disadvantage.

BIBLIOGRAPHY

- Abrutyn, S. & Mueller, A. (2014). The socioemotional foundations of suicide: A microsociological view of Durkheim's suicide. *American Sociological Association*, 32(4), 327-351.
- Billingsley, A. (1992). *Climbing Jacob's ladder: The enduring legacy of African American families*. New York: Simon & Schuster.
- Bollen, K. & Jackman, R. (1990). Regression diagnostics: An expository treatment of outliers and influential cases. In Fox, J. and Long, S. (Eds.), *Modern Methods of Data Analysis* (pp. 257-291). Newbury Park: Sage.
- Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-Based Injury Statistics Query and Reporting System (WISQARS). (2010). Retrieved from <<http://www.cdc.gov/injury/wisqars/index.html>>.
- Chatterjee, S. & Hadi, A. (1986). Influential observations, high leverage points, and outliers in linear regression. *Statistical Science*, 1(3), 379-393.
- City of Pittsburgh: Geographic Information Systems (GIS). (2010). Retrieved from <<http://pittsburghpa.gov/dcp/gis/gis-data-new>>.
- Coleman, J. (1990). *Foundations of social theory*. Cambridge, MA: Harvard University Press.
- Condorelli, R. (2013). A Bayesian analysis of suicide data: Testing the Durkheim's suicide theory: A suicide study in Italy. *Quality and Quantity*, 47(2), 1143-1161.
- Cornaglia, F., Feldman, N., & Leigh, A. (2014). Crime and mental well-being. *The Journal of Human Resources*, 49(1), 110-140.
- Denney, J., Rogers, R., Krueger, P., & Wadsworth, T. (2009). Adult suicide mortality in the United States: Marital status, family size, socioeconomic status, and differences by sex. *Social Science Quarterly*, 90(5), 1167-1185.
- Duck, W. (2015). *No way out: Precarious living in the shadow of poverty and drug dealing*. University of Chicago Press.

- Duck, W. & Rawls, A. (2010). Interaction orders of drug dealing spaces: Local orders of sense making in a poor black American place. *Crime, Law, and Social Change*, 57(1), 33-75.
- Durkheim, E. (1897/1951). *Suicide: A study in sociology*. Free Press.
- Early, K. (1992). *Religion and suicide in the African-American community*. Westport, CT: Greenwood Press.
- Gibbs, J. (1997). African-American suicide: A cultural paradox. *Suicide & Life - Threatening Behavior*, 27(1), 68-79.
- Joe, S., Baser, R., Breeden, G., Neighbors, H., & Jackson, J. (2006). Prevalence of and risk factors for lifetime suicide attempts among blacks in the United States. *JAMA*, 296(17), 2112-2123.
- Johansson, S. & Sundquist, J. (1997). Unemployment is an important risk factor for suicide in contemporary Sweden: An 11-year follow-up study of a cross-sectional sample of 37389 people. *Public Health*, 111, 41-45.
- Kelleher, M. & Daly, M. (1990). Suicide in Cork and Ireland. *British Journal of Psychiatry*, 157, 533-538.
- Lewis, G. & Sloggett, A. (1998). Suicide, deprivation, and unemployment: Record linkage study. *BJM*, 317, 1283-1286.
- Massey, D. & Eggers, M. (1990). The ecology of inequality: Minorities and the concentration of poverty, 1970-1980. *American Journal of Sociology*, 95, 1153-1189.
- O'Hare, W. & Mather, M. (2003). *The growing number of kids in severely distressed neighborhoods: Evidence from the 2000 Census*. Baltimore, MD: Annie E. Casey Foundation.
- Page, A., Taylor, R., Hall, W., & Carter, G. (2009). Mental disorders and socioeconomic status: Impact on population risk of attempted suicide in Australia. *Suicide and Life-Threatening Behavior*, 39(5), 471-481.
- Pursell, D., Heninger, M., Hanzlick, R., & Garlow, S. (2007). Differential association of socioeconomic status in ethnic and age-defined suicides. *Psychiatry Research*, 167, 258-265.
- Qin, P., Agerbo, E., & Mortensen, P. (2003). Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: A national register-based study of all suicides in Denmark, 1981-1997. *The American Journal of Psychiatry*, 160(4), 765-772.
- Sampson, R., Raudenbush, S., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*, 277, 918-924.

- Stack, S. (1983). The effect of religious commitment on suicide: A cross-national analysis. *Journal of Health and Social Behavior*, 24, 362-374.
- Stack, S. (2000a). Suicide: A 15-year review of the sociological literature. Part I: Cultural and economic factors. *Suicide & Life – Threatening Behavior*, 30(2), 145-162.
- Stack, S. (2000b). Suicide: A 15-year review of the sociological literature. Part II: Modernization and social integration. *Suicide & Life – Threatening Behavior*, 30(2), 145-162.
- Stark, R., Doyle, D., & Rushing, J. (1983). Beyond Durkheim: Religion and suicide. *Journal for the Scientific Study of Religion*, 22(2), 120-131.
- Steenland, K., Halperin, W., Hu, S., & Walker, J. (2002). Deaths due to injuries among employed adults: The effects of socioeconomic class. *Epidemiology*, 14, 74-79.
- Wallace, M., Harville, E., Theall, K., Webber, L., Chen, W., & Berenson, G. (2013). Neighborhood poverty, allostatic load, and birth outcomes in African American and White women: Findings from the Bogalusa Hearth Study. *Health and Place*, 24, 260-266.
- Willis, L., Coombs, D., Drentea, P., & Cockerham, W. (2003). Uncovering the mystery: Factors of African American suicide. *Suicide & Life - Threatening Behavior*, 33(4), 412-429.
- Zuberi, A., Duck, W., Gradeck, B., & Hopkinson, R. (In Press). Neighborhoods, race, and health: Examining the relationship between neighborhood distress and birth outcomes in Pittsburgh. *Journal of Urban Affairs*.