Environmental factors in crime: Assessing outdoor air pollution concentrations and weather variables

By

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A dissertation submitted to the

Graduate School-New Brunswick

Rutgers, The State University of New Jersey

In partial fulfillment of the requirements

For the degree of

Doctor of Philosophy

Graduate Program in Public Health (Environmental and Occupational Health)

Written under the direction of

Derek Shendell, D. Env, MPH

And approved by

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New Brunswick, New Jersey

January, 2016

ABSTRACT OF THE DISSERTATION

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Introduction: Though physiological effects of exposure to lead on cognitive function and crime have been discussed in the current literature, no studies to date have examined other air pollutants and climate/weather variables to assess multiple environmental factors and their potential impact on reported crime.

Methods: Data were collected through open public records provided by study location municipalities to assess the impact of environmental factors on daily crime rates in Chicago, Houston, Philadelphia and Seattle. Poisson regression analyses were performed to investigate associations between carbon monoxide (CO), particulate matter (PM), ozone (O_3), sulfur dioxide (SO_2) and climate/weather compared to several crime types.

Results: Increases in $PM_{2.5}$ concentrations were associated with increases in assault, damage and theft crimes while increases in apparent temperature were associated with increases in assault, burglary, robbery and theft crimes. Pollutants known to cause irritation, like PM_{10} and O_3, were associated with decreases in crime rates.

Conclusion: Environmental factors are associated with observable crime rate variability. Additional studies are needed to further understand the relationships between environmental factors and crime in order to reduce the adverse effects.

Acknowledgements

I would like to express my gratitude to my advisor, Dr. Derek Shendell, for his support from the first meeting we had even before I started my coursework at the School of Public Health. It was with his support and encouragement as a professor, NJ Safe Schools Program manager, and mentor that I was able to complete this dissertation. My thanks also go to the members of my committee, Drs. Jaime Madrigano, Qingyu Meng, Joel Miller and Pamela Ohman-Strickland for providing guidance to improve and enhance this dissertation. I would also like to thank GIS consultant Jennifer Rovito Whytlaw of the Edward J. Bloustein School of Planning and Public Policy at Rutgers.

Thank you to my friends and family for their ongoing support and understanding throughout this process. I am eager to no longer be able to say "I can't make it, I will be working on my dissertation." Thanks for being patient and listening to me talk about school for so many years. A special thanks to my parents who let me explore every possible major as an undergraduate student, allowing me to pursue higher education in a field I am passionate about.

Finally, many thanks to my biggest supporter, my husband, Jason Mapou. His love, patience, and encouragement throughout this entire process made everything possible. Thanks for being there for all the late nights studying, coffee breaks and for being my sounding board.

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Introduction

The Federal Bureau of Investigation (FBI) (FBI, 2014) reported in 2013 a violent crime occurred every 27.1 seconds with one murder, one rape, one robbery and one aggravated assault every 37 minutes, 6.6 minutes, 1.5 minutes and 43.5 seconds respectively. In New Jersey (NJ), every 24 hours one murder, two arsons, three rapes, 31 robberies, 35 aggravated assaults, 45 vehicle thefts, 116 burglaries and 336 larcenies occur (State of New Jersey, Division of State Police, 2012). In fact, a violent crime occurs every 20 minutes and 30 seconds (State of New Jersey, Division of State Police, 2012) resulting in a significant impact on public health throughout the state. Violent crime and adverse health impacts is not a new pairing; indeed, in 1979 the United States (U.S.) Surgeon General identified violence as a principal threat to health (Office of the Surgeon General., 1979). In addition, throughout the United States, property crimes occurred every 3.7 seconds with one burglary, one larceny-theft and one motor vehicle theft every 16.4 seconds, 5.3 seconds and 45.1 seconds respectively (FBI, 2014). Identifying environmental factors contributing to crime has the potential to prevent future crimes throughout the United States, which ultimately impacts the public's health.

This study aims to assess the impact of environmental factors such as outdoor air pollutants subject to government monitoring and regulation and weather variables on changes in crime reported in four urban cities in the United States.

Research Question:

Can fluctuations in local crime, within four major cities in different U.S. climate regions, be attributed to changes in outdoor air pollution concentrations and weather variables recorded by government air monitoring stations?

Hypothesis to be tested:

Fluctuations in local crime reports will be significantly correlated with changes in outdoor air pollution concentrations and weather variables.

Background

The First Environmental Factor: Lead

As a result of regulatory efforts that required the removal of lead from gasoline, air-lead concentrations were reduced by 94% between 1980 and 1999 (EPA, 2014). When plotting violent crime rates in relation to air-lead concentrations after lead was removed from gasoline, an observable statistically significant decline in violent crime was identified (Nevin, 2000). Many studies assessing the relationship between air-lead and crime have concluded they have a direct relationship (Mielke & Zahran, 2012; Stretesky & Lynch, 2004; Needleman et al. 1996; Denno, 1990; Pihl & Ervin, 1990). Stretesky & Lynch (2004) reported statistically significant relationships between air-lead levels and both violent crimes and property crimes as well. In addition, air-lead concentrations have been reported to have statistically significant relationships to delinquent behavior (Needleman et al, 1996) and aggravated assault (Mielke & Zahra, 2012).

In a study following 497 males from birth to age 24, Denno (1993) reported how lead poisoning was among the strongest predictors of crime. Furthermore, the relationship was so strong, Denno (1993) concluded any attorney could make the case that lead poisoning causes brain damage or neurological dysfunction and use an insanity defense in a court of law. Many researchers have corroborated how lead can cause adverse outcomes to the brain like reduction in cognitive function and a decreased IQ (Mielke & Zahra, 2012; Nevin, 2007; Stretesky & Lynch, 2004; Nevin, 1999; Needleman et al, 1996; Pihl & Ervin, 1990). A study analyzing state-level IQ data in relation to crime suggested IQ was significantly and negatively correlated with the violent crimes of murder, aggravated assault and robbery, and of property crimes of motor vehicle theft and burglary (Bartels et al., 2010). Beaver & Wright (2011) isolated cases within one state county to analyze past observed associations between decreased cognitive function and crime and analyses suggested associations were not confounded by social disadvantage, race and/or poverty.

Neuro-developmental effects of outdoor air pollution are important to the research of crime and its relationship to outdoor air pollution exposure, as decreased cognitive function could perpetuate crime due to the known relationship between low IQ and increased crime rates (Burhan et al., 2014; Beaver & Wright, 2011; Bartels et al., 2010).

Outdoor Air Pollution and Adverse Neurological Outcomes

Human Subjects

While few studies have analyzed potential associations of other outdoor ambient air pollutants routinely monitored by government air quality monitoring stations, research has suggested other types of air pollution could be responsible for similar properties causing neurodegeneration potentially causing cognitive delays (Power et al., 2011; Freire et al., 2010; Calderón-Garcidueñas et al., 2008). Power et al (2011) reported that long-term traffic related air pollution was associated with decreased cognitive function in older men aged 51 to 97 years. Similarly, Freire et al (2010) used nitrogen dioxide (NO_2) as a marker for traffic related air pollution and concluded children (age 4) with estimated NO_2 exposure greater than 24.75 $\mu g/m^3$, had decreases in cognitive functions relating to quantitative, working memory and gross motor areas. This study concluded traffic related pollution may cause adverse outcomes in cognitive function in children and may have negative neuro-developmental effects, especially early in life (Freire et al, 2010).

In another study, when observing 55 children, 56% had prefrontal white matter hyper-intense lesions associated with neuro-inflammation detected by MRI and attributable to chronic exposure to ozone (O_3), particulate matter (PM), and lipopolyssacharides in Mexico City (Calderón-Garcidueñas et al., 2008). In addition, high prenatal polycyclic aromatic hydrocarbon (PAH) exposure, defined as greater than the median of 2.27 ng/m^3,was positively associated with symptoms of anxiousness, depression and attention problems in children from New York City observed from *in utero* to age 6 or 7 (Perera et al, 2012). Outdoor air pollution has been linked to several central nervous system (CNS) diseases like Parkinson's disease and Alzheimer's disease in addition to general neuro-degeneration and neuro-inflammation (Zanobetti, 2014; Costa et al, 2014; Genc et al, 2011; Calderón-Garcidueñas et al, 2002). A study looking at 121 U.S. communities and comparing Medicare enrollees with hospital visits suggested every 10 μg/m^3 increase in the two-day average of fine PM or $PM_{2.5}$ was significantly associated with increased hospitalizations due to Parkinson's disease (Zanobetti, 2014). In a study throughout the State of Georgia, coarse PM or PM_{10} was found to have a systemic immune response and cause inflammation, thus playing a potential role in the etiology of multiple sclerosis in females (Gregory et al, 2008).

As a result, a panel held by the National Institute of Environmental Health Sciences/National Institute of Health identified exploring the effect of specific air pollution components on increased risk for neuro-developmental disorders, neurodegenerative disease and mental disorders as a research priority (Block et al., 2012). The following three areas were determined to be critical research areas: identify specific chemicals like metals, PAHs and volatile organic compounds (VOCs) and/or physical properties of PM sizes likely responsible for the inflammatory/neurotoxic effects in the brain and CNS; examine toxicokinetics relating to entryways, biotransformation, distribution and elimination of air pollution from the brain; and, identify vulnerable populations based on animal and epidemiology studies (Block et al., 2012).

Animal Models

In an animal model, rats were exposed to 2.0, 0.5 and 0 mg/m^3 of diesel exhaust for four weeks and demonstrated elevated levels of interleuin-6 (IL-6), nitrated proteins and ionized calcium-binding adaptor molecule 1 (IBA-1), which indicated neuro-inflammation (Levesque et al, 2011). A mouse study conducted by Fonken et al (2011) reported those mice exposed to ambient $PM_{2.5}$ had an elevated level of hippocampal pro-inflammatory cytokines in comparison to those exposed only to filtered air. Mice exposed to ultrafine PM or $PM_{0.1}$ during their first two weeks of life were found to be more likely to choose an immediate reward over responding for a delayed reward, leaving Allen et al (2013) to conclude PM can alter decision making ability due to adverse effects on the CNS.

Biological Plausibility

Block et al (2012) concluded outdoor, and indoor, air pollution is related to the CNS in several ways including modulation of molecular, neurochemical and biological pathways, neuro-inflammation, neurotoxicity and neurobehavioral changes.

Outdoor air pollution has been associated with Alzheimer's disease, Parkinson's disease and neuro-developmental disorders, with several biological mechanisms supporting the plausibility of outdoor air pollution being associated with these adverse health outcomes (Genc et al, 2011; Calderón-Garcidueñas et al, 2002). Recent studies have identified several possible biological pathways in support of further research assessing relationships between crime and air pollutants thought to cause neuro-inflammation, oxidative stress, cerebrovascular damage, and neurodegenerative pathology (Kasala et al., 2014; Maes et al., 2011; Block et al., 2009). Liu and Lewis (2014) also concluded outdoor air pollution may act via multiple pathways, explaining wide reaching effects on the brain and CNS.

Genc et al (2011) outlined how nano-sized particles can translocate to the CNS and activate an immune response, and how emerging research evidenced the idea of air pollution-induced neuro-inflammation, oxidative stress, microglial activation, cerebrovascular dysfunction, and alterations in the blood-brain barrier contributing to CNS pathology. Glass et al (2010) explained how neuro-inflammation can activate microglial cells, which then infiltrate T cells and monocytes, which is thought to lead to neurodegeneration and depression (Maes et al, 2011). Block & Calderón-Garcidueñas (2009) proposed cytokines may impact the peripheral innate immune cells, activating peripheral neuronal afferents which then enter the brain through diffusion and active transport to cause adverse impacts to the CNS. In addition, affected circulated cytokines produce systemic inflammatory response markers, such as TNFa and IL-1b, which can cause neuro-inflammation, neurotoxicity and cerebrovascular damage (Qin et al, 2007; Perry et al, 2007).

Acute Air Pollution Effects

Though a majority of studies relating to outdoor air pollution, neuro-developmental outcomes and crime have focused on long-term effects of exposure, other air pollution studies have demonstrated how such air pollution can have short-term health and behavior implications. For example, studies have suggested acute increases in fine and ultrafine particles are associated with cardiovascular death (Brook et al, 2004; Dockery, 2001; Peters, 2001; Seaton et al, 1995). Similarly, extreme increases in air pollution have been associated with large increases in sickness and death (Dockery & Pope, 1994). Dockery and Pope (1994) highlighted how this relationship has been observed throughout the world in locations like Meuse Valley, Belgium, Donora, Pennsylvania and London, England, which experienced episodes of extreme air pollution.

Less extreme increases in outdoor air pollution concentrations have also been reported to have measurable adverse health outcomes. For example, Rich et al (2012) reported systolic blood pressure and heart rate were statistically significantly associated with increased air pollution concentrations observed over a short period of time. In fact, a study of healthy adults exposed to fine particulate matter and ozone concentrations occurring in an urban environment for only two hours showed significant brachial artery vasoconstriction (Brook, 2002).

Acute increases in particulate matter (PM) concentrations have also been reported to increase pulmonary inflammation (Lin et al, 2011). When exposing healthy volunteers to diesel exhaust, markers of pulmonary inflammation were measurable six hours after exposure (Salvi, 1999). Pope et al (2004) measured C-reactive protein as a biomarker for inflammation and reported fine particles or $PM_{2.5}$ may influence inflammation. Van Eeden et al (2001) observed the effect of varying sizes of PM (0.1, 1, and 10 μm) on alveolar macrophages and concluded the particles stimulated the alveolar macrophages, which caused them to produce pro-inflammatory cytokines. The acute relationship between exposure to outdoor air pollutants and inflammation demonstrated in the aforementioned studies suggested air pollutants activating immune responses in the brain could also have an acute relationship.

Anderson et al (2012) reported data have demonstrated a relationship between PM and human disease, supporting the notion outdoor air pollution could impact neuro-developmental and neuro-degenerative diseases, ultimately affecting crime rates. To date, no study has explored the effects of acute exposure to multiple outdoor air pollutants on crime rates.

Weather Variables

An early study of weather and crime concluded weather is one of the factors affecting crime, but the causal relationship may often be masked by other factors (Pakiam, 1981). This study called for advanced statistical analyses to separate factors and highlight the causal relationship between weather and crime. Studies have also looked at the effects of weather variables like temperature and relative humidity in relation to crime. In a study focusing on the United States, 30 years of crime and weather data were analyzed and it was concluded outdoor temperature had a strong effect on crime (Ranson, 2014). In a similar study conducted in New Zealand, temperature and precipitation were both identified as having had a significant effect on the number of violent crimes (Horrocks & Menclova, 2011). Additionally, Horrocks and Menclova (2011) reported how temperature had an effect on the number of property crimes reported.

Several other studies have also reported temperature was significantly related to homicide (DeFronzo, 1984), assault (Bushman et al, 2005), domestic violence (Cohn, 1993), robbery (Sorg & Taylor, 2011), violent crimes (Gamble & Hess, 2012; Cotton, 1986; Field, 1992), property offenses (Cohn & Rotten, 2000; Field, 1992; DeFronzo, 1984) and overall crime rates (Mares, 2013; Salleh et al, 2012). Furthermore, seasonal weather changes have been reported to interact with temperature changes impacting crime rates (McDowall et al, 2012). Brunsdon et al (2009) evaluated the spatial patterning of disorders and disturbances with police calls for service, and reported outdoor temperature and humidity had significant effects. In addition, Hipp et al (2004) reported property crime was associated with pleasant weather, while Harries et al (1984) reported assaults peaked in the summer. Similarly, Cheatwood (1988) reported the months of December, July and August were the most likely months for peak homicide rates.

Routine Activity and Crime Patterns

When introducing the theory of Routine Activity, Cohen and Felson (1979) stated three factors must be present for a crime to occur: motivated offenders, suitable targets and the absence of capable guardians against a violation. Their study stated the likelihood of these factors being present at one time can be altered by changes in routine activities thus potentially creating increases in crime rates over time (Cohen & Felson, 1979). The Encyclopedia of Theoretical Criminology explained crime is most likely to occur in the pattern of movement of the offender (Miro, 2014). Therefore, if a potential target and offender have a similar activity pattern, the likelihood of a crime occurring will increase. Sherman (1995) explained how just having a target and an offender is not enough for a crime to occur. Sherman (1995) further stated place is also an essential component.

Weisburb et al (2014) determined how offenders in immediate situational opportunities are a significant factor to the development of crime hot spots and reported that the likelihood of being in an area of chronic crime was statistically significant near public facilities, bus stops, arterial roads and vacant land. Similarly, Eck (2002) outlined likely places for target/offender interactions: stores, homes, apartment buildings, street corners, subway stations and airports. In addition, Madensen and Eck (2008) reported crime is more concentrated in areas with bars and within bars themselves; other researchers have reported similar findings relating to the presence of bars and alcohol (Roncek and Bell, 1981; Roncek and Maier, 1991; Kumar and Waylor, 2002; Gruenewald et al, 2006; Livingston, 2008; Grubesic & Pridemore, 2011).

Andresen (2006) reported a state of unemployment leaves an additional 8 to 10 hours per day for someone to become a target or an offender, whereas, criminal activity would be less likely if those unemployed were at a place of employment those additional hours. Similarly, Tewksbury and Mustaine (2003) reported employed college students were less likely to carry means of self-protection, and unemployed students may be more exposed to criminal acts. Phillips and Land (2012) tested the theory of unemployment fluctuations being a predictive factor for crime using United States Uniform Crime Report data and suggested the theory was correct on a county, state and national level. In a similar study, Fallahi et al (2012) reported statistically significant relationships between unemployment and burglary and motor vehicle theft.

Methods

Institutional Review Board

The data used for this study are publically available and accessible online. These data do not include any personal identifying information. Therefore, it was not possible to trace crimes back to any individuals and this study did not need additional precautions to protect personal information. This study was approved by the Rutgers Electronic Institutional Review Board on May 1, 2015.

Study Location Selection

Daily crime data ranging from 2009 to 2013 was requested through individual Open Public Records Act (OPRA) requests to towns with outdoor government air monitoring stations in New Jersey (NJ) with hourly air monitor data logged from 2009 to 2013. A similar OPRA request was also submitted to the Federal Bureau of Investigation (FBI) to request the information for the same set of towns in an effort to standardize the information and maximize the data received. See Appendix A for a description of locations included in the OPRA request. Due to the current data management capabilities of the FBI, daily and weekly crime data were not available, nor were any of the New Jersey locations able to provide daily crime data. Monthly data was available for three of the twelve locations, and received from Jersey City, Rahway and Chester. Spotcrime.com was also explored as a possibility for creating a new dataset with daily data for Jersey City. However, the number of crimes reported did not seem consistent and reports cut off at the end of November, 2013, eliminating the ability to create a dataset for the 2009 to 2013 study period. See Table 1 for a summary of each location.

Table 1: Summary of NJ Towns that provided Crime Data

	Jersey City	Rahway	Chester
Estimated Population	257,300	28,400	1,700
Land Area	14.8 mi^2	3.9 mi^2	1.4 mi^2
Town Type	Urban/City	Urban/City	Suburban/Town
High school graduate or higher	84.5%	87.3%	92.6%
Housing units	108,720	11,300	647
Per capita money income	$32,289	$28,710	$40,852
Median household income	$58,308	$59,412	$86,705
Persons below poverty level	17.6%	10.4%	3.4%
Total number of businesses	20,193	1,789	N/A
Source	U.S. Census Bureau, 2014a	U.S. Census Bureau, 2014b	U.S. Census Bureau, 2010

(U.S. Census Bureau, 2010, 2014a-b)

Several limitations were identified for these locations; for example, monthly data eliminates the ability to calculate a lag as the expected lag would need to be analyzed by day and not by month. In addition, the monthly data do not offer event based details like where the crime occurred and at what time, which eliminates the possibility to deduce crime behavior patterns relating to a specific location within each city or a more likely time of day based on community activities. Due to this, the monthly data available did not allow for hot spot maps and limited analysis capabilities. In addition, since Chester is a small town, it did not have the same level of Census data available as Jersey City and Rahway creating inconsistent data availability between the three NJ locations.

To reduce these limitations, the scope of the study was expanded to the greater United States to explore data availability for other cities by identifying more sophisticated data management systems that offered public access to daily crime statistics, including location and time of the crime. Identifying more robust datasets increased the number of data points to thus increase the power of the study. Many local police and sheriff departments were identified as reporting data through the CrimeMapping.com portal. However, most data sets only dated back six months to one year. Other databases were identified (e.g., Open Data Philly, Data.Seattle.gov, City of Chicago Data Portal, Houston Police Department Crime Statistics) and locations were selected based on the availability of outdoor air pollution data from the Environmental Protection Agency (EPA) and daily crime data available from 2009 to 2013 with time and location of each crime. The cities meeting these parameters were: Chicago, Houston, Philadelphia and Seattle.

These locations represent multiple climate zones and have varying population age ranges, jobs, income, housing, races and ethnicities. The variance between locations enables the study to compare each crime type by environmental factors and also differences in socioeconomic factors between locations. The specific attributes were also summarized by geographic location to explain differences between the cities that could impact crime. See Tables 2-5 for a summary of each location's demographic, social and economic attributes. These data were obtained from the United States Census Bureau (via American Community Survey) as 5-year estimates representing 2009 to 2013.

Though the identification of new cities reduced limitations, this study was an exploratory ecological study looking at defined geographical cities/urban areas. The results demonstrated associations between crime types and parameters, not causation.

Table 2: Summary of Demographic Attributes by Study Location from 2009-2013

Demographics	Chicago		Houston		Philadelphia		Seattle	
	Estimate	%	Estimate	%	Estimate	%	Estimate	%
Gender								
Total population	*2,706,101*	*100%*	*2,134,707*	*100%*	*1,536,704*	*100%*	*624,681*	*100%*
Male	1,313,565	48.5%	1,069,676	50.1%	725,293	47.2%	310,551	49.7%
Female	1,392,536	51.5%	1,065,031	49.9%	811,411	52.8%	314,130	50.3%
Age Group								
Median age (yrs)	*33.3*		*32.4*		*33.6*		*36.1*	
Under 5 years	185,031	6.8%	169,938	8.0%	104,388	6.8%	33,182	5.3%
5 to 9 years	164,006	6.1%	152,821	7.2%	90,923	5.9%	27,577	4.4%
10 to 14 years	163,917	6.1%	138,201	6.5%	90,995	5.9%	22,611	3.6%
15 to 19 years	178,995	6.6%	139,308	6.5%	110,889	7.2%	30,105	4.8%
20 to 24 years	218,740	8.1%	172,109	8.1%	142,694	9.3%	53,977	8.6%
25 to 34 years	517,001	19.1%	379,772	17.8%	257,811	16.8%	133,500	21.4%
35 to 44 years	380,889	14.1%	299,038	14.0%	189,091	12.3%	98,931	15.8%
45 to 54 years	339,334	12.5%	271,487	12.7%	195,804	12.7%	80,351	12.9%
55 to 59 years	148,867	5.5%	118,729	5.6%	88,607	5.8%	39,243	6.3%
60 to 64 years	125,113	4.6%	94,643	4.4%	77,777	5.1%	34,710	5.6%
65 to 74 years	155,402	5.7%	113,253	5.3%	97,936	6.4%	38,176	6.1%
75 to 84 years	89,814	3.3%	60,492	2.8%	60,988	4.0%	20,444	3.3%
18 years +	2,090,850	77.3%	1,591,358	74.5%	1,192,324	77.6%	528,564	84.6%
21 years +	1,974,212	73.0%	1,502,465	70.4%	1,108,578	72.1%	501,379	80.3%
62 years +	356,306	13.2%	251,766	11.8%	231,864	15.1%	90,532	14.5%
65 years +	284,208	10.5%	198,661	9.3%	187,725	12.2%	70,494	11.3%
85 years +	38,992	1.4%	24,916	1.2%	28,801	1.9%	11,874	1.9%
Race								
One race	*2,650,450*	*97.9%*	*2,097,064*	*98.2%*	*1,497,755*	*97.5%*	*591,961*	*94.8%*
White	1,294,544	47.8%	1,236,091	57.9%	637,842	41.5%	440,866	70.6%
Black	873,393	32.3%	501,087	23.5%	665,332	43.3%	46,310	7.4%
American or Alaska Native	7,180	0.3%	9,216	0.4%	4,433	0.3%	4,474	0.7%
Asian	154,506	5.7%	133,326	6.2%	99,962	6.5%	87,953	14.1%
Hawaiian or Pacific Islander	702	0.0%	926	0.0%	1,359	0.1%	2,567	0.4%
Other race	320,125	11.8%	216,418	10.1%	88,827	5.8%	9,791	1.6%
Two or more races	*55,651*	*2.1%*	*37,643*	*1.8%*	*38,949*	*2.5%*	*32,720*	*5.2%*
White and Black	12,833	0.5%	6,925	0.3%	14,656	1.0%	4,768	0.8%
American & Alaska Native	5,122	0.2%	6,274	0.3%	3,263	0.2%	5,102	0.8%
White and Asian	12,751	0.5%	8,115	0.4%	4,730	0.3%	12,909	2.1%
Black & American or Alaska Native	2,765	0.1%	1,136	0.1%	2,844	0.2%	1,291	0.2%
Ethnicity								
Total population	*2,706,101*		*2,134,707*		*1,536,704*		*624,681*	
Hispanic or Latino	775,748	28.7%	931,154	43.6%	194,714	12.7%	40,110	6.4%
Mexican	576,553	21.3%	707,516	33.1%	15,430	1.0%	25,744	4.1%
Puerto Rican	104,453	3.9%	9,251	0.4%	131,574	8.6%	1,839	0.3%
Cuban	8,528	0.3%	7,611	0.4%	3,720	0.2%	1,068	0.2%
Other Hispanic / Latino	86,214	3.2%	206,776	9.7%	43,990	2.9%	11,459	1.8%
Not Hispanic / Latino	1,930,353	71.3%	1,203,553	56.4%	1,341,990	87.3%	584,571	93.6%

(American Community Survey, 2009-2013)

Table 3: Summary of Economic Attributes by Study Location from 2009-2013

Economic Status	Chicago		Houston		Philadelphia		Seattle	
	Estimate	%	Estimate	%	Estimate	%	Estimate	%
Status of Employment								
Population 16 years and up	*2,159,678*	*79.8%*	*1,647,341*	*77.2%*	*1,231,556*	*80.1%*	*537,098*	*86.0%*
In labor force	1,431,906	66.3%	1,122,106	68.1%	729,562	59.2%	390,059	72.6%
Civilian labor force	1,431,300	66.3%	1,121,400	68.1%	729,113	59.2%	388,724	72.4%
Employed	1,236,807	57.3%	1,016,880	61.7%	619,094	50.3%	361,705	67.3%
Unemployed	194,493	9.0%	104,520	6.3%	110,019	8.9%	27,019	5.0%
Not in labor force	727,772	33.7%	525,235	31.9%	501,994	40.8%	147,039	27.4%
Mode of commuting to work								
Car, truck, or van - alone	608,545	50.3%	756,102	75.7%	305,048	50.5%	183,163	51.5%
Car, truck, or van - carpool	112,080	9.3%	123,058	12.3%	53,098	8.8%	31,320	8.8%
Public transportation (excluding taxicab)	323,465	26.7%	42,970	4.3%	157,891	26.1%	68,318	19.2%
Walked	79,576	6.6%	21,446	2.1%	51,677	8.5%	32,117	9.0%
Worked at home	52,227	4.3%	32,796	3.3%	18,163	3.0%	23,240	6.5%
Other means	33,906	2.8%	22,981	2.3%	18,697	3.1%	17,296	4.9%
Mean travel time (minutes)	33.3		25.9		31.8		25.4	
Industry								
Agriculture, forestry, fishing & hunting, and mining	1,998	0.2%	26,859	2.6%	1,148	0.2%	1,513	0.4%
Arts, entertainment, recreation, and food services	137,331	11.1%	94,301	9.3%	59,917	9.7%	40,327	11.1%
Construction	49,710	4.0%	103,135	10.1%	24,837	4.0%	11,503	3.2%
Education, health care & social assistance	280,153	22.7%	195,206	19.2%	188,938	30.5%	86,293	23.9%
Finance & insurance, real estate, rental & leasing	106,014	8.6%	59,820	5.9%	39,237	6.3%	22,046	6.1%
Information	29,368	2.4%	14,456	1.4%	12,494	2.0%	13,777	3.8%
Manufacturing	114,278	9.2%	94,333	9.3%	42,522	6.9%	26,227	7.3%
Professional, scientific, management, administrative & waste management	186,405	15.1%	142,287	14.0%	70,523	11.4%	71,236	19.7%
Public administration	54,942	4.4%	25,559	2.5%	39,645	6.4%	12,522	3.5%
Retail trade	110,787	9.0%	108,156	10.6%	64,384	10.4%	38,658	10.7%
Transportation and warehousing & utilities	71,866	5.8%	56,291	5.5%	32,800	5.3%	11,194	3.1%
Wholesale trade	29,671	2.4%	33,578	3.3%	13,123	2.1%	7,751	2.1%
Other services, except public administration	64,284	5.2%	62,899	6.2%	29,526	4.8%	18,658	5.2%

Table 3 (Continued)								
Occupation								
Management, business, science & arts	468,478	37.9%	337,744	33.2%	220,074	35.5%	200,074	55.3%
Natural resources, construction & maintenance	69,614	5.6%	124,262	12.2%	35,759	5.8%	13,265	3.7%
Production, transportation, & material moving occupations	158,597	12.8%	129,011	12.7%	67,006	10.8%	21,594	6.0%
Sales & office	287,332	23.2%	227,783	22.4%	151,682	24.5%	70,387	19.5%
Service	252,786	20.4%	198,080	19.5%	144,573	23.4%	56,385	15.6%
Class of Worker								
Government	158,534	12.8%	99,754	9.8%	84,549	13.7%	53,551	14.8%
Private wage and salary	1,020,185	82.5%	843,221	82.9%	509,712	82.3%	284,360	78.6%
Self-employed (not incorporated business)	56,922	4.6%	72,735	7.2%	23,991	3.9%	23,403	6.5%
Unpaid family workers	1,166	0.1%	1,170	0.1%	842	0.1%	391	0.1%
Total Income and Benefits (In 2013 inflation-adjusted dollars)								
Total households	*1,028,746*		*781,407*		*580,017*		*288,439*	
Less than $10,000	115,750	11.3%	69,259	8.9%	85,487	14.7%	22,388	7.8%
$10,000 to $14,999	61,542	6.0%	49,753	6.4%	47,475	8.2%	11,687	4.1%
$15,000 to $24,999	120,527	11.7%	102,578	13.1%	77,996	13.4%	21,632	7.5%
$25,000 to $34,999	106,436	10.3%	91,647	11.7%	65,784	11.3%	23,954	8.3%
$35,000 to $49,999	131,399	12.8%	111,299	14.2%	79,811	13.8%	33,914	11.8%
$50,000 to $74,999	166,003	16.1%	125,401	16.0%	90,822	15.7%	47,538	16.5%
$75,000 to $99,999	110,339	10.7%	76,557	9.8%	54,171	9.3%	35,418	12.3%
$100,000 to $149,999	114,520	11.1%	76,869	9.8%	48,013	8.3%	45,202	15.7%
$150,000 to $199,999	47,739	4.6%	32,681	4.2%	16,244	2.8%	20,973	7.3%
$200,000 or more	54,491	5.3%	45,363	5.8%	14,214	2.5%	25,733	8.9%
Median household income	47,270		45,010		37,192		65,277	
Mean household income	71,745		71,475		54,367		91,765	
Median earnings	31,228		26,828		29,266		39,412	
Per capita income	28,436		27,305		22,279		43,237	
Income below U.S. federal poverty level (as %)								
All families	*18.6%*		*19.5%*		*21.1%*		*7.2%*	
Children under 18 years	27.5%		29.1%		30.5%		10.4%	
Children under 5 years only	21.2%		25.5%		25.9%		7.9%	
Married couple families	*9.3%*		*12.4%*		*9.4%*		*3.6%*	
Children under 18 years	13.7%		18.9%		13.2%		4.4%	
Children under 5 years only	8.2%		14.7%		9.5%		2.2%	
Families with female householder, no husband	*35.4%*		*36.8%*		*36.6%*		*21.8%*	
Children under 18 years	46.2%		47.5%		45.7%		28.9%	
Children under 5 years	47.8%		46.6%		44.7%		31.4%	
All people	*22.6%*		*22.9%*		*26.5%*		*13.6%*	
Under 18 years	33.4%		35.3%		36.3%		13.4%	
18 years and over	19.5%		18.6%		23.6%		13.6%	
18 to 64 years	19.8%		19.2%		24.8%		13.7%	
65 years and over	17.2%		14.2%		17.3%		13.2%	

Table 3 (Continued)								
Status of Health Insurance								
With health insurance	2,153,354	80.3%	1,496,066	70.6%	1,300,850	85.5%	548,401	88.7%
With private health insurance	1,432,643	53.4%	992,038	46.8%	853,217	56.1%	478,672	77.4%
With public coverage	892,314	33.3%	628,143	29.6%	607,019	39.9%	124,054	20.1%
No health insurance	529,242	19.7%	624,002	29.4%	220,126	14.5%	69,986	11.3%

(American Community Survey, 2009-2013)

Table 4: Summary of Housing Attributes by Study Location from 2009-2013

Housing Attributes	Chicago		Houston		Philadelphia		Seattle	
	Estimate	%	Estimate	%	Estimate	%	Estimate	%
Housing Occupancy								
Total housing units	*1,192,790*		*907,494*		*668,806*		*309,205*	
Occupied housing units	1,028,746	86.2%	781,407	86.1%	580,017	86.7%	288,439	93.3%
Vacant housing units	164,044	13.8%	126,087	13.9%	88,789	13.3%	20,766	6.7%
Units in Structure								
1-unit, detached	304,534	25.5%	413,903	45.6%	55,486	8.3%	137,779	44.6%
1-unit, attached	42,175	3.5%	46,984	5.2%	389,773	58.3%	13,511	4.4%
2 units	177,158	14.9%	16,303	1.8%	58,958	8.8%	9,385	3.0%
3 or 4 units	195,521	16.4%	34,622	3.8%	42,223	6.3%	12,933	4.2%
5 to 9 units	129,529	10.9%	64,318	7.1%	26,822	4.0%	19,484	6.3%
10 to 19 units	54,382	4.6%	136,539	15.0%	14,977	2.2%	26,179	8.5%
20 or more units	286,717	24.0%	185,800	20.5%	79,054	11.8%	88,480	28.6%
Mobile home	2,298	0.2%	8,547	0.9%	1,385	0.2%	1,234	0.4%
Boat, RV, van, etc.	476	0.0%	478	0.1%	128	0.0%	220	0.1%
Year Structure Built								
Built 2010 or later	3,083	0.3%	7,979	0.9%	1,675	0.3%	2,501	0.8%
Built 2000 to 2009	100,038	8.4%	137,711	15.2%	22,587	3.4%	42,585	13.8%
Built 1990 to 1999	51,070	4.3%	82,978	9.1%	17,172	2.6%	25,719	8.3%
Built 1980 to 1989	46,213	3.9%	125,516	13.8%	26,370	3.9%	24,999	8.1%
Built 1970 to 1979	81,613	6.8%	228,842	25.2%	46,038	6.9%	29,082	9.4%
Built 1960 to 1969	116,038	9.7%	135,663	14.9%	71,202	10.6%	28,608	9.3%
Built 1950 to 1959	150,256	12.6%	103,134	11.4%	112,234	16.8%	35,868	11.6%
Built 1940 to 1949	104,618	8.8%	45,001	5.0%	104,836	15.7%	30,204	9.8%
Built 1939 or earlier	539,861	45.3%	40,670	4.5%	266,692	39.9%	89,639	29.0%
Total Number of Rooms								
1 room	70,732	5.9%	19,523	2.2%	23,742	3.5%	20,264	6.6%
2 rooms	54,553	4.6%	36,175	4.0%	22,375	3.3%	29,420	9.5%
3 rooms	162,870	13.7%	177,312	19.5%	82,916	12.4%	54,246	17.5%
4 rooms	242,664	20.3%	191,445	21.1%	93,006	13.9%	53,719	17.4%
5 rooms	258,633	21.7%	174,636	19.2%	94,887	14.2%	40,994	13.3%
6 rooms	201,974	16.9%	138,076	15.2%	180,527	27.0%	32,260	10.4%
7 rooms	87,456	7.3%	74,705	8.2%	92,788	13.9%	26,969	8.7%
8 rooms	50,849	4.3%	44,417	4.9%	40,995	6.1%	20,436	6.6%
9 rooms or more	63,059	5.3%	51,205	5.6%	37,570	5.6%	30,897	10.0%
Median rooms	4.8		4.7		5.6		4.4	
Number of Bedrooms								
Total housing units	*1,192,790*		*907,494*		*668,806*		*309,205*	*309,205*
No bedroom	80,997	6.8%	21,256	2.3%	26,638	4.0%	24,240	7.8%
1 bedroom	242,526	20.3%	223,567	24.6%	111,837	16.7%	83,133	26.9%
2 bedrooms	406,763	34.1%	272,802	30.1%	144,695	21.6%	86,239	27.9%
3 bedrooms	327,098	27.4%	273,984	30.2%	307,427	46.0%	67,522	21.8%
4 bedrooms	93,873	7.9%	98,845	10.9%	57,226	8.6%	34,618	11.2%
5 or more bedrooms	41,533	3.5%	17,040	1.9%	20,983	3.1%	13,453	4.4%
Housing Tenure								
Owner-occupied	466,089	45.3%	354,667	45.4%	308,931	53.3%	134,924	46.8%
Renter-occupied	562,657	54.7%	426,740	54.6%	271,086	46.7%	153,515	53.2%

Table 4 (Continued)

Year Resident Moved Into Housing Unit								
Moved in 2010 or later	218,336	21.2%	211,027	27.0%	105,387	18.2%	73,880	25.6%
Moved in 2000 to 2009	498,861	48.5%	366,119	46.9%	254,349	43.9%	140,857	48.8%
Moved in 1990 to 1999	145,841	14.2%	95,578	12.2%	85,087	14.7%	35,828	12.4%
Moved in 1980 to 1989	70,955	6.9%	44,418	5.7%	50,239	8.7%	18,540	6.4%
Moved in 1970 to 1979	52,004	5.1%	36,516	4.7%	38,409	6.6%	10,557	3.7%
Moved in 1969 or earlier	42,749	4.2%	27,749	3.6%	46,546	8.0%	8,777	3.0%
Vehicles Available								
No vehicles available	275,932	26.8%	77,654	9.9%	192,361	33.2%	46,130	16.0%
1 vehicle available	458,888	44.6%	338,653	43.3%	250,213	43.1%	124,187	43.1%
2 vehicles available	227,057	22.1%	265,415	34.0%	109,694	18.9%	88,203	30.6%
3 or more vehicles available	66,869	6.5%	99,685	12.8%	27,749	4.8%	29,919	10.4%
Primary home heating fuel used								
Utility gas	866,364	84.2%	293,597	37.6%	449,493	77.5%	109,165	37.8%
Bottled, tank, or LP gas	9,144	0.9%	3,753	0.5%	5,325	0.9%	2,492	0.9%
Electricity	132,808	12.9%	478,053	61.2%	87,949	15.2%	149,643	51.9%
Fuel oil, kerosene, etc.	2,834	0.3%	361	0.0%	32,821	5.7%	21,199	7.3%
Coal or coke	231	0.0%	65	0.0%	272	0.0%	135	0.0%
Wood	222	0.0%	421	0.1%	536	0.1%	1,120	0.4%
Solar energy	123	0.0%	96	0.0%	105	0.0%	173	0.1%
Other fuel	7,907	0.8%	496	0.1%	948	0.2%	2,206	0.8%
No fuel used	9,113	0.9%	4,565	0.6%	2,568	0.4%	2,306	0.8%
Assessed Value of Home (in U.S. dollars)								
Median Assessed Value	233,200		123,900		142,500		433,800	
Less than $50,000	15,407	3.3%	27,737	7.8%	34,787	11.3%	1,790	1.3%
$50,000 to $99,999	37,595	8.1%	103,835	29.3%	68,625	22.2%	725	0.5%
$100,000 to $149,999	58,082	12.5%	77,659	21.9%	58,185	18.8%	1,685	1.2%
$150,000 to $199,999	79,009	17.0%	41,194	11.6%	51,901	16.8%	4,945	3.7%
$200,000 to $299,999	118,202	25.4%	43,361	12.2%	56,817	18.4%	19,499	14.5%
$300,000 to $499,999	103,368	22.2%	36,558	10.3%	26,652	8.6%	56,123	41.6%
$500,000 to $999,999	42,608	9.1%	17,673	5.0%	9,463	3.1%	41,641	30.9%
$1,000,000 or more	11,818	2.5%	6,650	1.9%	2,501	0.8%	8,516	6.3%
Mortgage Status								
Housing units with a mortgage	337,171	72.3%	209,541	59.1%	186,585	60.4%	101,503	75.2%
Housing units without a mortgage	128,918	27.7%	145,126	40.9%	122,346	39.6%	33,421	24.8%
Gross Rent (in U.S. dollars)								
Median Gross Rent	949		848		893		1,091	
Less than $200	11,305	2.1%	3,666	0.9%	6,547	2.5%	2,403	1.6%
$200 to $299	18,295	3.3%	5,176	1.2%	11,045	4.3%	5,070	3.4%
$300 to $499	26,297	4.8%	18,792	4.5%	17,409	6.7%	5,976	4.0%
$500 to $749	92,773	16.9%	124,929	30.1%	48,334	18.7%	14,012	9.3%
$750 to $999	155,322	28.3%	122,915	29.7%	77,891	30.1%	36,639	24.4%
$1,000 to $1,499	156,363	28.5%	101,048	24.4%	70,178	27.1%	49,143	32.8%
$1,500 or more	87,578	16.0%	37,906	9.1%	27,278	10.5%	36,693	24.5%
No rent paid	14,724		12,308		12,404		3,579	

(American Community Survey, 2009-2013)

Table 5: Summary of Social Attributes by Study Location from 2009-2013

Social Information	**Chicago**		**Houston**		**Philadelphia**		**Seattle**	
	Estimate	%	Estimate	%	Estimate	%	Estimate	%
Housing Makeup								
Population in households	*2,652,782*	*98.0%*	*2,104,278*	*98.6%*	*1,486,620*	*96.7%*	*601,070*	*96.2%*
Householder	1,028,746	38.8%	781,407	37.1%	580,017	39.0%	288,439	48.0%
Spouse	334,264	12.6%	304,898	14.5%	159,856	10.8%	100,071	16.6%
Child	796,898	30.0%	669,152	31.8%	467,536	31.4%	114,948	19.1%
Other relatives	295,981	11.2%	216,648	10.3%	164,701	11.1%	24,240	4.0%
Nonrelatives	196,893	7.4%	132,173	6.3%	114,510	7.7%	73,372	12.2%
Unmarried partner	72,565	2.7%	47,436	2.3%	36,033	2.4%	25,252	4.2%
Marital Status								
Males 15 years and over	*1,053,559*	*38.9%*	*834,961*	*39.1%*	*579,526*	*37.7%*	*268,142*	*42.9%*
Never married	538,973	51.2%	356,519	42.7%	311,903	53.8%	125,693	46.9%
Now married, except separated	390,263	37.0%	363,313	43.5%	188,054	32.4%	109,323	40.8%
Separated	22,669	2.2%	24,326	2.9%	17,999	3.1%	3,386	1.3%
Widowed	23,956	2.3%	16,199	1.9%	18,288	3.2%	4,313	1.6%
Divorced	77,698	7.4%	74,604	8.9%	43,282	7.5%	25,427	9.5%
Females 15 years and over	*1,139,588*	*42.1%*	*838,786*	*39.2%*	*670,872*	*43.7%*	*273,169*	*43.7%*
Never married	521,335	45.7%	296,087	35.3%	327,889	48.9%	110,538	40.5%
Now married, except separated	375,356	32.9%	341,304	40.7%	181,169	27.0%	108,002	39.5%
Separated	33,454	2.9%	35,597	4.2%	25,037	3.7%	3,702	1.4%
Widowed	96,607	8.5%	66,138	7.9%	69,315	10.3%	18,004	6.6%
Divorced	112,836	9.9%	99,660	11.9%	67,462	10.1%	32,923	12.1%
School Enrollment								
Population 3 years and over enrolled in school	*722,627*	*26.7%*	*564,871*	*26.5%*	*421,991*	*27.5%*	*146,405*	*23.4%*
Nursery school, preschool	49,126	6.8%	37,977	6.7%	26,924	6.4%	10,221	7.0%
Kindergarten	32,806	4.5%	33,071	5.9%	19,097	4.5%	5,842	4.0%
Elementary school (grades 1-8)	263,561	36.5%	236,007	41.8%	143,411	34.0%	38,576	26.3%
High school (grades 9-12)	142,504	19.7%	109,584	19.4%	80,546	19.1%	17,024	11.6%
College or graduate school	234,630	32.5%	148,232	26.2%	152,013	36.0%	74,742	51.1%

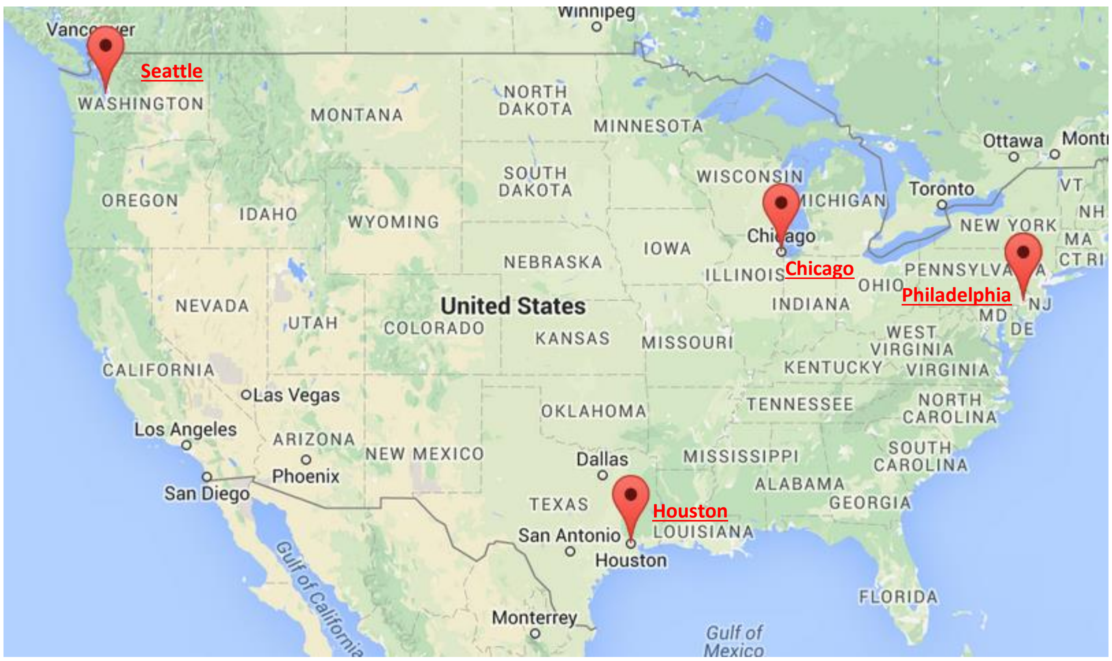
Table 5 (Continued)

Educational Attainment								
Population 25 years and over	*1,795,412*	*66.3%*	*1,362,330*	*63.8%*	*996,815*	*64.9%*	*457,229*	*73.2%*
Less than 9th grade	170,532	9.5%	191,247	14.0%	60,950	6.1%	14,795	3.2%
9th to 12th grade, no diploma	168,617	9.4%	144,005	10.6%	126,696	12.7%	16,483	3.6%
High school graduate (includes equivalency)	415,747	23.2%	306,355	22.5%	344,142	34.5%	53,684	11.7%
Some college, no degree	327,914	18.3%	260,140	19.1%	176,149	17.7%	79,079	17.3%
Associate's degree	98,633	5.5%	62,595	4.6%	51,014	5.1%	30,831	6.7%
Bachelor's degree	366,725	20.4%	246,894	18.1%	137,480	13.8%	156,446	34.2%
Graduate or professional degree	247,244	13.8%	151,094	11.1%	100,384	10.1%	105,911	23.2%
High school graduate or higher	1,456,263	81.1%	1,027,078	75.4%	809,169	81.2%	425,951	93.2%
Bachelor's degree or higher	613,969	34.2%	397,988	29.2%	237,864	23.9%	262,357	57.4%
Disability Status of Civilian Noninstitutionalized Population								
With a disability	*286,821*	*10.7%*	*209,434*	*9.9%*	*239,682*	*15.8%*	*55,239*	*8.9%*
Under 18 years with a disability	20,660	3.4%	19,564	3.6%	20,716	6.0%	2,080	2.2%
18 to 64 years with a disability	154,940	8.6%	115,641	8.4%	141,863	14.2%	29,521	6.5%
65 years and over with a disability	111,221	40.2%	74,229	38.1%	77,103	42.6%	23,638	34.7%
U.S. Citizen Status								
Foreign-born population	*569,328*	*21.0%*	*604,475*	*28.3%*	*186,913*	*12.2%*	*110,496*	*17.7%*
Naturalized U.S. citizen	232,763	40.9%	166,496	27.5%	91,507	49.0%	57,989	52.5%
Not a U.S. citizen	336,565	59.1%	437,979	72.5%	95,406	51.0%	52,507	47.5%
Region of World of Origin of Foreign-born Population								
Europe	101,143	17.8%	24,292	4.0%	34,810	18.6%	15,900	14.4%
Asia	122,348	21.5%	117,077	19.4%	74,646	39.9%	60,146	54.4%
Africa	19,771	3.5%	25,372	4.2%	19,446	10.4%	12,851	11.6%
Oceania	1,079	0.2%	1,164	0.2%	562	0.3%	1,700	1.5%
Latin America	320,245	56.2%	432,190	71.5%	56,175	30.1%	13,775	12.5%
Northern America	4,742	0.8%	4,380	0.7%	1,274	0.7%	6,124	5.5%
Veteran Status	91,958	4.4%	84,874	5.3%	74,487	6.2%	32,864	6.2%

(American Community Survey, 2009-2013)

Figure 1 shows a map of the United States illustrating the location of each city. The geographic differences between study locations made it possible to consider built environment attributes by location in relation to the number of crimes occurring by crime type. The physical location of each city also created variability between temperature, humidity and other environmental attributes.

Figure 1: Location of Study Cities

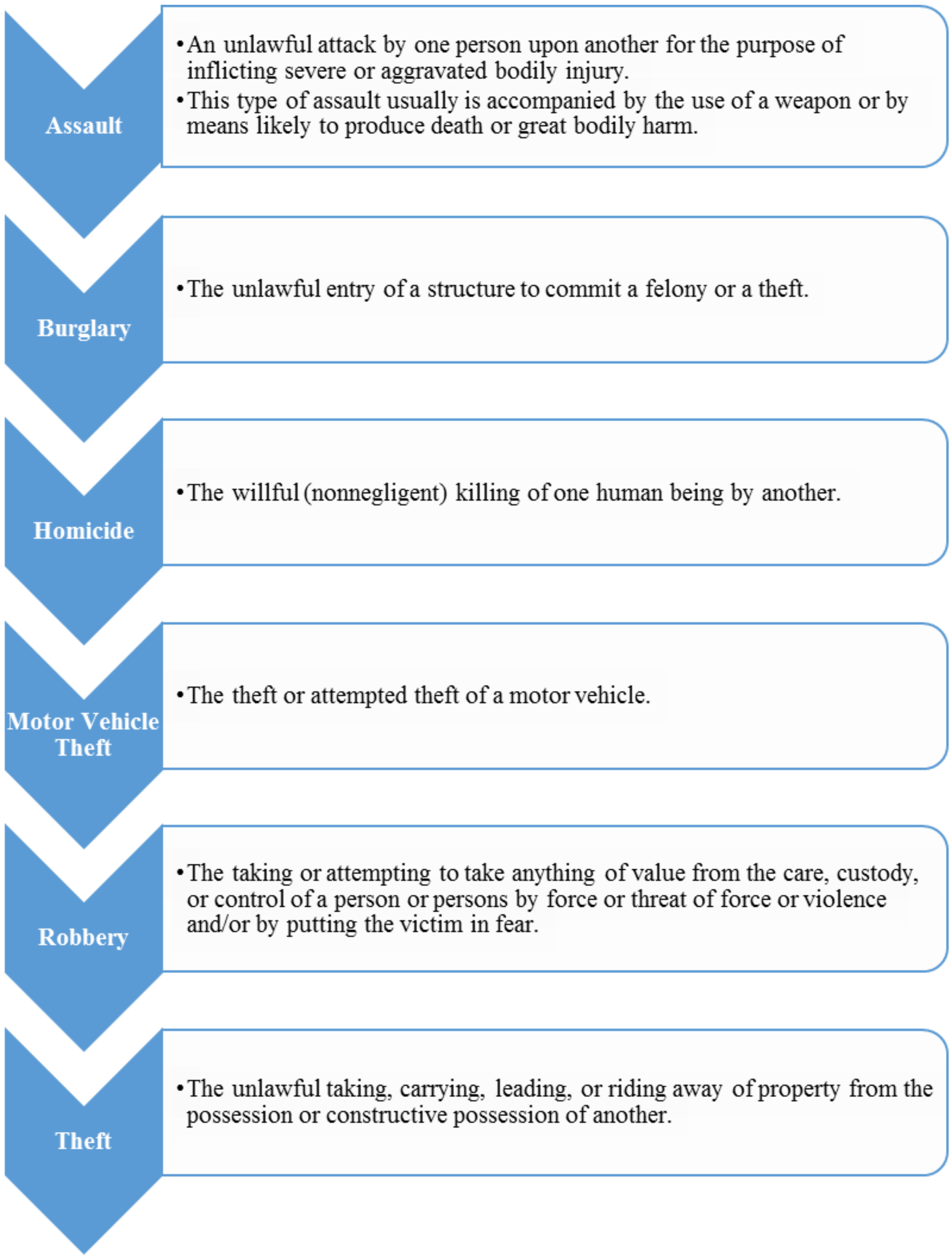


(Created online using MapCustomizer.com)

Crime Data

The crime data available for each city varied. The main dataset consisting of all study cities included the main crime types define by the United States Department of Justice. Figure 2 defines each of these main crime types.

Figure 2: Crime Data Variables



(USDOJ, 2004)

Crime categories were standardized and matched across locations to create models for sub analyses based on similarities between locations. Table 6 outlines the crime types available for each location and defines the finalized crime categories and those that were eliminated. The main standardized crime types, defined in Figure 2, needed minimal changes for standardization. The category “Assault” is comprised of assault and battery crimes in Chicago and aggravated assault in Houston and Philadelphia. Similarly, Chicago and Philadelphia used the term “Motor Vehicle Theft” while the terms “Auto Theft” and “Vehicle Theft” were used in Houston and Seattle respectively.

In order to compare additional crimes across locations, crime types were combined into one category to include multiple locations. For example, rape, criminal sexual assault and sex offenses were combined into one category called “Rape and Sex Crimes”. In addition, the crime types arson and reckless burning were combined into one category called “Arson and Burning” and property damage and criminal damage were combined into one category called “Damage”.

In locations like Chicago and Seattle, several crime types were eliminated. In some cases, crime types were eliminated because they would have required pre-planning to commit the crime and therefore would not be affected by the environmental attributes in this study. Categories like counterfeiting, forgery, fraud, eluding-felony flight, embezzling and extortion are examples of crime types that required pre-planning or previous actions that require more than impulse. Other categories were eliminated because they are non-criminal reports held by the local police department like animal bites, false report, traffic, property found and recovered stolen motor vehicle. Additional crime types relating to drug charges, prostitution and other civil disturbances were excluded from this study due to the nature of the crimes.

Table 6: Crime Variable Standardization Summary

	Chicago	**Houston**	**Philadelphia**	**Seattle**
Standardized Categories	*Raw Data Categories*			
Assault	Assault/Battery	Aggravated Assault	Aggravated Assault	Assault
Burglary	Burglary	Burglary	Burglary	Burglary
Homicide	Homicide	Murder	Homicide	Homicide
Motor Vehicle Theft	Motor Vehicle Theft	Auto Theft	Motor Vehicle Theft	Vehicle Theft
Robbery	Robbery	Robbery	Robbery	Robbery
Theft	Theft	Theft	Theft	Theft
Sub-Categories	*Raw Data Categories*			
Arson and Reckless Burning	Arson	N/A	N/A	Reckless Burning
Damage	Criminal damage	N/A	N/A	Property Damage
Disorderly conduct	N/A	N/A	N/A	Disorderly Conduct
Harassment	N/A	N/A	N/A	Harassment / Malicious Harassment
Interference with public officer	Interference with public officer	N/A	N/A	N/A
Rape and Sex Crimes	Criminal Sexual Assault / Sex Offense	Rape	Rape	N/A
Trespass	Criminal Trespass	N/A	N/A	Trespass
Excluded Categories	Deceptive practice, gambling, intimidation, kidnapping, narcotics, non-criminal, obscenity, offense involving children, prostitution, public indecency, public peace violation, other offense, stalking, weapons violation	N/A	Recovered stolen motor vehicle	Animal (bite, cruelty, other), Bias incident, Counterfeit, Dispute (civil property), Disturbance (noise, other), Drive by, DUI (Liquor, drugs), Eluding-felony flight, Embezzle, Endangerment, Escape, Extortion, False report, Fireworks, Forgery, Fraud, Harbor- criminal code, violation, Illegal dumping, Injury, Liquor, law violation, Loitering, Narcotics (all), Obstruct, Pornography, soda-viol, Traffic, public urination/defecation, property found, prostitution, court order, warrant, weapon

Data were cleaned and organized in Microsoft Excel. A primary dataset was developed to include all the main crime types; assault, burglary, homicide, motor vehicle theft, robbery and theft. Additional datasets were developed to analyze different crime types across locations and model available data within each city. Table 7 outlines the crime types analyzed in each dataset.

Table 7: Summary of Crime Variables included in each Dataset

Dataset #	Dataset Name	Crime Variables Included
1	All Location	Assault, Burglary, Homicide, Motor Vehicle Theft, Robbery, Theft
2	All but Seattle	Assault, Burglary, Homicide, Motor Vehicle Theft, Robbery, Theft, Rape & Sex Crime
3	Chicago & Seattle	Assault, Burglary, Homicide, Motor Vehicle Theft, Robbery, Theft, Arson & Burning, Damage, Trespass
4	Chicago	Assault, Burglary, Homicide, Motor Vehicle Theft, Robbery, Theft, Trespass, Arson & Burning, Damage, Rape & Sex Crime, Interference with Officer
5	Houston	Assault, Burglary, Homicide, Motor Vehicle Theft, Robbery, Theft, Rape & Sex Crime
6	Philadelphia	Assault, Burglary, Homicide, Motor Vehicle Theft, Robbery, Theft, Rape & Sex Crime
7	Seattle	Assault, Burglary, Homicide, Motor Vehicle Theft, Robbery, Theft, Trespass, Arson & Burning, Damage, Disorderly Conduct, Harassment

Activity factors from the Exposure Factors Handbook (USEPA, 2011) were identified to consider values for routine activities that may explain differences in crime observed between locations. Factors considered were broken into indoor and outdoor categories. Indoor factors considered were time spent in restaurants, school, grocery/convenience stores/malls, bars/nightclubs/bowling alley or at work. Outdoor factors considered were time spent playing outdoors, on a sidewalk, street or in the neighborhood, at home in a yard, in a parking lot, waiting at a bus, train, etc. stop, near a vehicle and cumulative time spent outside the residence. Each of these factors were matched to the study city's Census data to calculate the approximate activity patterns of each location based on the factors listed by sex, age, race, ethnicity, weekday, weekend and season.

Outdoor (Ambient) Air Pollution Data

Daily data from outdoor government air monitoring stations in Chicago, Houston, Philadelphia and Seattle were downloaded via the Environmental Protection Agency (EPA) public air monitoring web site from 2009 to 2013 (EPA, 2014). Table 8 outlines the outdoor air pollutants monitored for each city and downloaded for each study location.

Table 8: Daily Air Pollution Data Availability for Study Cities

	CO	NO_2	O_3	Pb	$PM_{2.5}$	PM_{10}	SO_2
Chicago	X	X	X	X	X	X	X
Houston	X	X	X	X	X	X	X
Philadelphia	X	X	X	X	X	X	X
Seattle	X		X		X		X

Each report exported from the EPA also included the daily air quality index (AQI) based on the calculation outlined in Figure 3 (EPA, 2006). Figures 4-7 show the locations of the local air monitoring stations in each city.

Figure 3: U.S. Environmental Protection Agency (EPA) Equation used to Calculate Pollutant Specific Air Quality Index (AQI)

$$I_p = \frac{I_{Hi} - I_{Lo}}{BP_{HI} - BP_{Lo}}(C_p - BP_{Lo}) + I_{Lo}$$

Where Ip = the index for pollutant p

Cp = the rounded concentration of pollutant p

BPHi = the breakpoint that is greater than or equal to Cp

BPLo = the breakpoint that is less than or equal to Cp

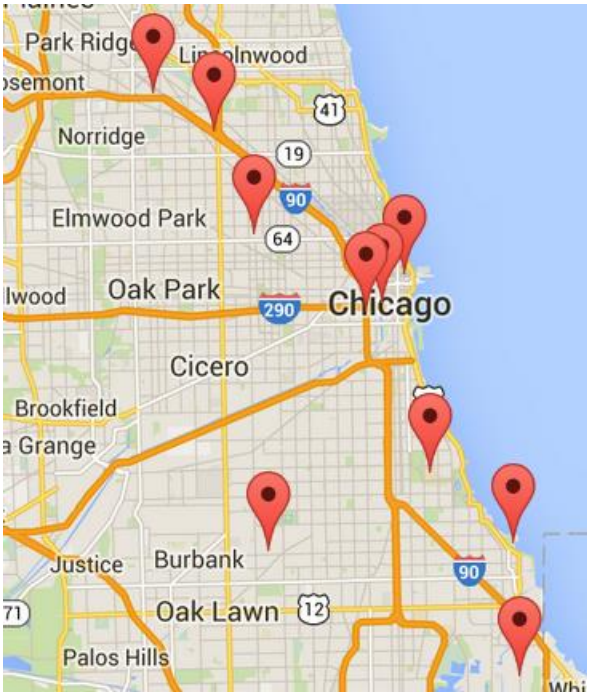
BPHi = the breakpoint that is greater than or equal to Cp

IHi = the AQI value corresponding to BPHi

ILo = the AQI value corresponding to BPLo

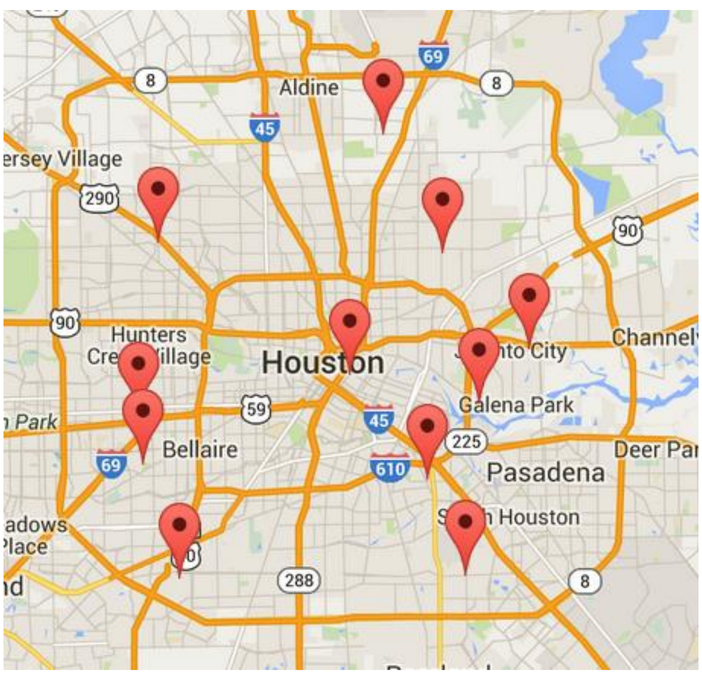
(EPA, 2006)

Figure 4: Chicago Air Monitoring Station Locations (see Appendix B.i for addresses)



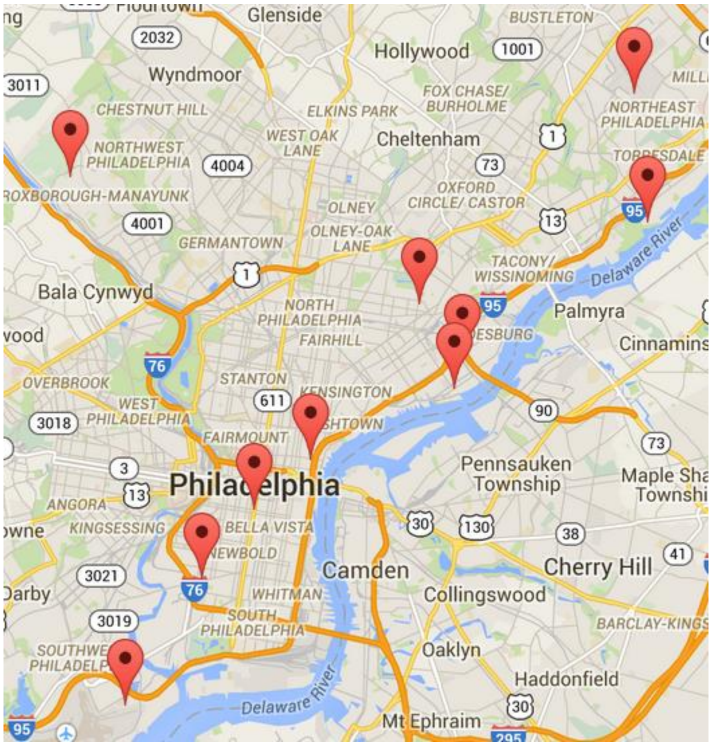
(created online using MapCustomizer.com)

Figure 5: Houston Air Monitoring Station Locations (See Appendix B.ii for addresses)



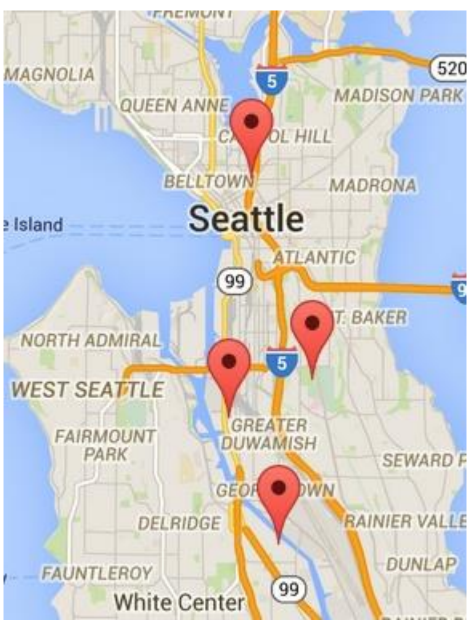
(created online using MapCustomizer.com)

Figure 6: Philadelphia Air Monitoring Station Locations (See Appendix B.iii for addresses)



(created online using MapCustomizer.com)

Figure 7: Seattle Air Monitoring Station Locations (See Appendix B.iv for addresses)



(created online using MapCustomizer.com)

The ambient outdoor air quality data were sorted by geographic coordinates of the monitoring stations to determine the readings from within each city. The locations included air monitoring stations within a radius extending outside of city limits. In these cases, the monitoring stations were in nearby towns and were removed. City averages were calculated to determine a daily average based on local air monitoring stations within each city. These data were managed and cleaned in Microsoft Excel and subsequently matched to each city's crime data. This method created an aggregate daily data report of crime and air pollution concentrations for each location to analyze the potential relationships between changes in outdoor air pollution concentrations and the number of crimes reported by day.

Fourteen datasets were created based on the categories of crime available by location and air monitoring station data. Table 9 summarizes the datasets created to compare air pollution concentrations and AQI information available. Lead (Pb), since it was available for some locations, was included in the initial datasets but then removed because of the inability to produce results due to the amount of missing data.

Table 9: Summary of Crime Variables included in each Dataset

Dataset #	Dataset Name	Air Pollution Variables Included
1a	All Location	Carbon Monoxide (CO), Ozone (O_3), Particulate Matter 2.5 ($PM_{2.5}$), Sulfur Dioxide (SO_2)
1b	All Location	Carbon Monoxide (CO) AQI, Ozone (O_3) AQI, Particulate Matter 2.5 ($PM_{2.5}$) AQI, Sulfur Dioxide (SO_2) AQI
2a	All but Seattle	Carbon Monoxide (CO), Ozone (O_3), Nitrogen Dioxide (NO_2), Particulate Matter 2.5 ($PM_{2.5}$), Particulate Matter 10 (PM_{10}), Sulfur Dioxide (SO_2)
2b	All but Seattle	Carbon Monoxide (CO) AQI, Ozone (O_3) AQI, Nitrogen Dioxide (NO_2) AQI, Particulate Matter 2.5 ($PM_{2.5}$) AQI, Particulate Matter 10 (PM_{10}) AQI, Sulfur Dioxide (SO_2) AQI
3a	Chicago & Seattle	Carbon Monoxide (CO), Ozone (O_3), Particulate Matter 2.5 ($PM_{2.5}$), Sulfur Dioxide (SO_2)
3b	Chicago & Seattle	Carbon Monoxide (CO) AQI, Ozone (O_3) AQI, Particulate Matter 2.5 ($PM_{2.5}$) AQI, Sulfur Dioxide (SO_2) AQI
4a	Chicago	Carbon Monoxide (CO), Ozone (O_3), Nitrogen Dioxide (NO_2), Particulate Matter 2.5 ($PM_{2.5}$), Particulate Matter 10 (PM_{10}), Sulfur Dioxide (SO_2)
4b	Chicago	Carbon Monoxide (CO) AQI, Ozone (O_3) AQI, Nitrogen Dioxide (NO_2) AQI, Particulate Matter 2.5 ($PM_{2.5}$) AQI, Particulate Matter 10 (PM_{10}) AQI, Sulfur Dioxide (SO_2) AQI
5a	Houston	Carbon Monoxide (CO), Ozone (O_3), Nitrogen Dioxide (NO_2), Particulate Matter 2.5 ($PM_{2.5}$), Particulate Matter 10 (PM_{10}), Sulfur Dioxide (SO_2)
5b	Houston	Carbon Monoxide (CO) AQI, Ozone (O_3) AQI, Nitrogen Dioxide (NO_2) AQI, Particulate Matter 2.5 ($PM_{2.5}$) AQI, Particulate Matter 10 (PM_{10}) AQI, Sulfur Dioxide (SO_2) AQI
6a	Philadelphia	Carbon Monoxide (CO), Ozone (O_3), Nitrogen Dioxide (NO2), Particulate Matter 2.5 ($PM_{2.5}$), Particulate Matter 10 (PM_{10}), Sulfur Dioxide (SO_2)
6b	Philadelphia	Carbon Monoxide (CO) AQI, Ozone (O_3) AQI, Nitrogen Dioxide (NO_2) AQI, Particulate Matter 2.5 ($PM_{2.5}$) AQI, Particulate Matter 10 (PM_{10}) AQI, Sulfur Dioxide (SO_2) AQI
7a	Seattle	Carbon Monoxide (CO), Ozone (O_3), Particulate Matter 2.5 ($PM_{2.5}$), Sulfur Dioxide (SO_2)
7b	Seattle	Carbon Monoxide (CO) AQI, Ozone (O_3) AQI, Particulate Matter 2.5 ($PM_{2.5}$) AQI, Sulfur Dioxide (SO_2) AQI

Weather Data

Weather information was requested from 2009 to 2013 from the National Climactic Data Center. However, most data provided were not viable, and likely were the maximum values the air monitor could report for a majority of the readings. An alternative database maintained by the Weather Channel was identified and daily weather data was downloaded for each city. Table 10 summarizes the weather variables exported to create the weather data portion of the dataset.

Table 10: Weather Variables Available for Study Cities

Variable	Unit		Variable	Unit
Temperature	Fahrenheit (F)		Visibility	Miles (mi)
Dew Point	Fahrenheit (F)		Wind Speed	Miles Per Hour (MPH)
Humidity	Percent (%)		Precipitation	Inches (in)
Cloud Cover	Yes/No		Wind Direction	Degrees (°)

The above variables were used to calculate temperature (Celsius), visibility (Kilometers), wind speed (meters per second) and precipitation (millimeter). Humidex (Masterson and Richardson, 1979) and apparent temperature (Meng et al, 2012; Steadman, 1984) were also calculated to create two additional independent variables for analyses to consider how the combined temperature, relatively humidity and air feels outside to determine the likelihood of a crime occurring when the humidex and/or apparent temperature values are high and thus are known to cause discomfort. See Figures 8 and 9 for Apparent Temperature (Meng et al, 2012; Steadman, 1984) and Humidex (Masterson and Richardson, 1979) formulas, respectively.

Figure 8: Apparent Temperature Equation

$$AT= T*(0.33*e) – (0.7*w)-4$$

T= Temperature (C^o)

$e= 6.112*10^{((7.5*T) / (237.7+T))}*(H/100)$

w= wind speed (meters per second)

H= Humidity (C^o)

(Meng et al, 2012; Steadman, 1984)

Figure 9: Humidex Equation

$$Hx = T+((5/9)*(e-10))$$

T= Temperature (Cº)

$$e = 6.112*10^{((7.5*T) / (237.7+T))}*(H/100)$$

H= Humidity (Cº)

(Masterson and Richardson, 1979)

Due to the similarities between different weather variables, not all variables could be included in the datasets because they were recognized by SAS (Cary, NC) as similar variables and removed from the analyses. The final datasets include the following weather/climate variables: apparent temperature (C°), humidex, mean visibility (Km), mean wind speed (m/s), precipitation (mm), cloud cover (%).

The number of degree days (heating and cooling), were calculated based on the EPAs climate change indicator definition of heating days having a temperature colder than 65 degrees Fahrenheit and cooling days having a temperature warmer than 65 degrees Fahrenheit (EPA, 2015) . This information was compared to weather and season information for each study location to provide a better understanding of the climate distribution by year.

Mapping

Maps were created using the Geographic Information System (GIS) platform ArcGIS. GIS maps utilized Topologically Integrated Geographic Encoding and Referencing (TIGER) shapefiles downloaded from the U.S. Census Bureau (Census, 2015). Maps used standard roadway curbing information. Information about local emission sources was downloaded from the U.S. EPA air emission sources database to show the location of the crimes in relation to prominent outdoor point and area sources of air pollution. The crime data provided by each municipality included the latitude and longitude information so each crime could be mapped by point, with the expectation of Houston. The Houston data had location information by block and police beat (geographic patrol area) (City of Houston, 2015) which was used to aggregate crimes into centralized points within each block. Crime data were aggregated in Excel to determine the number of crimes for each specific latitude / longitude combination (or block) to determine if some areas were more prone to crime than others.

In some cases, the complete set of data points were not able to fit on the map because the crime type had many data points over the five year study period. In these cases, a sample of the data was used to create the map, though in these cases, this remains unnoticeable because several points are already on top of each other. Additional maps were created (data not presented) to initially examine other built environment attributes. However, the inclusion well known built environmental attributes like bus stops, on the maps were not legible due to the vast amount of points for each crime category.

Statistical Analyses

Descriptive statistics were calculated in Microsoft Excel to determine the average number of crimes reported based on holidays, seasons and day of the week by city. Summaries of weather/climate variables, outdoor air pollution concentrations and daily AQI were also calculated by season and location. Microsoft Excel was used to calculate the number of heating and cooling degree days by year and location and the average number of each crime type occurring on heating days and cooling days.

SAS 9.4 (Cary, NC), was used to perform univariate analyses to describe the distribution of each crime variable focusing on median, mean, mode, range, quantiles, variance and standard deviation. Dummy variables were used to code data to indicate federal holidays and observances to consider the likelihood of changes in human activity patterns during federal holidays and observances. This is because people may have day(s) off from work and/or children may not be in school. These variables were considered to see if they have an effect on the results when compared with regular days throughout different days of the week or seasons. Differences between days of the week were assessed by assigning each day of the week as the reference day to see the variability of each week day in comparison to the reference day. Weekdays and weekends were also compared post analysis to see if the likelihood of each crime type could be attributed to weekend behavior versus weekday behavior.

Data were analyzed in SAS using Poisson regression with the crime data as the dependent variable to control for population size and potential zeros in the data. Poisson regression models were run for each of the fourteen datasets. Study models corrected for over dispersion, location and day of the week. In models with multiple cities, the cities were coded to account for differences between locations. Socio-demographic factors were considered post analyses and were not considered potential confounders for analyses because they do not vary by day. Variance calculations were completed to consider intra-city variability in comparison to variance across cities for each pollutant by crime type to determine which datasets would be considered primary in the results section. Figure 10 shows the formula for the variance calculation.

Figure 10: Calculation of Variance within and Between Cities

$$[(1/ (1-c))*(ßi-ß)^2]+[(1/c)(se^2)]$$

c= Number of cities

ßi= estimate for ith city

ß= estimate across study cities

se= standard error of ßi

A time series regression was also completed to determine the relationship between the dependent and independent variables over time using the ARIMA procedure in SAS. It should be noted, however, this method is not able to assess the impact of environmental factors because it is unable to consider how each crime type was affected by the environmental factors happening prior to the crime occurring. To account for this, lags were calculated by pollutant and crime type to assess if higher concentrations of outdoor air pollution resulted in increased crimes one to five days after higher pollutant concentrations were observed. Therefore, only the lag calculation results are presented in this study.

Results

Tables 11-16 summarize the descriptive statistics for each of the main crime types across locations. Chicago had the highest average number of daily crimes for assault, homicide, motor vehicle theft, robbery and theft with 224.6, 1.2, 45.4, 38.1, and 208.0 respectively. Seattle had the lowest average number of crimes for each of the assessed crime types with 6.5, 13.7, 0.03, 7.6, 2.8, and 41.3 for assault, burglary, homicide, motor vehicle theft, robbery and theft crimes respectively. The city specific variance for each crime type was large within individual study cities, with the exception of homicide where the variance did not exceed 1.6. The descriptive statistics supported the number of models used within this study; some cities had higher crimes rates than others, which could have affected the results of the models with each study location.

Table 11: Assault Descriptive Statistics

Assault	Chicago	Houston	Philadelphia	Seattle
Mean	224.6	26.3	24.1	6.5
Mode	196	0	23	0
Standard Deviation	46.4	11.2	7.0	4.8
Variance	2150	125.2	49.3	22.9
0% (Minimum)	94	0	6	0
25% Quartile	190	21	19	2
50% Quartile (Median)	222	27	24	7
75% Quartile	254	33	28	10
100% (Maximum)	426	72	71	26

Table 12: Burglary Descriptive Statistics

Burglary	Chicago	Houston	Philadelphia	Seattle
Mean	66	67.2	29.4	13.7
Mode	73	0	28	0
Standard Deviation	18.3	26.2	0.03	8.7
Variance	334.5	684.5	81.6	75.1
0% (Minimum)	19	0	6	0
25% Quartile	52	56	24	6
50% Quartile (Median)	66	71	29	15
75% Quartile	79	85	34	20
100% (Maximum)	124	133	146	45

Table 13: Homicide Descriptive Statistics

Homicide	Chicago	Houston	Philadelphia	Seattle
Mean	1.2	0.5	1.1	0.03
Mode	1	0	0	0
Standard Deviation	1.3	0.8	1.1	0.2
Variance	1.6	0.61	1.3	0.03
0% (Minimum)	0	0	0	0
25% Quartile	0	0	0	0
50% Quartile (Median)	1	0	1	0
75% Quartile	2	1	2	0
100% (Maximum)	7	5	9	2

Table 14: Motor Vehicle Theft Descriptive Statistics

Motor Vehicle Theft	Chicago	Houston	Philadelphia	Seattle
Mean	45.4	31.7	12.5	7.6
Mode	48	35	9	0
Standard Deviation	11.6	11.7	7.1	5.2
Variance	133.6	136.8	50.9	26.8
0% (Minimum)	18	0	1	0
25% Quartile	37	28	7	3
50% Quartile (Median)	45	34	11	8
75% Quartile	53	39	18	11
100% (Maximum)	84	61	43	27

Table 15: Robbery Descriptive Statistics

Robbery	Chicago	Houston	Philadelphia	Seattle
Mean	38.1	23.9	22.9	2.8
Mode	36	0	21	3
Standard Deviation	9.4	9.9	5.9	2.2
Variance	88.9	97.8	34.6	4.8
0% (Minimum)	9	0	6	0
25% Quartile	32	20	19	1
50% Quartile (Median)	38	25	23	3
75% Quartile	45	30	27	4
100% (Maximum)	76	55	50	12

Table 16: Theft Descriptive Statistics

Theft	Chicago	Houston	Philadelphia	Seattle
Mean	208.0	179.1	104.4	41.3
Mode	215	202	104	1
Standard Deviation	35.4	58.6	20.7	25.7
Variance	1251	3429	429.84	658.8
0% (Minimum)	62	0	19	0
25% Quartile	185	172	90	8
50% Quartile (Median)	209	193	104	50
75% Quartile	231	211	118	61
100% (Maximum)	458	278	166	97

Additional summary statistics were calculated to understand the distribution of crimes by day of the week, federal holidays or observances and season. Tables 17 through 19 show the average number of daily crimes by crime type and day of the week and on regular days compared to federal holidays and observances, respectively. A higher number of average crimes were observed on regular days in comparison to federal holidays with the exception of average assaults in Houston and Philadelphia. Similarly, a higher number of average crimes were observed on regular days in comparison to observances with the exception of assault crimes in Chicago, Houston and Philadelphia.

Table 19 shows the average number of daily crimes by type, day of the week and city. Assault had a higher average on Friday, Saturday and Sunday across locations. The highest numbers of average daily burglary crimes were on Fridays in Chicago, Houston and Seattle. The highest number of burglary crimes in Philadelphia was observed on Monday. Likewise, the highest numbers of daily thefts were observed on Friday in Chicago, Houston and Seattle, while in Philadelphia the highest average numbers of daily thefts were on Tuesday and Wednesday.

Table 17: Summary of Average Daily Crime by Type and Day of the Week from 2009 to 2013

	Average # Daily Assault	Average # Daily Burglary	Average # Daily Homicide	Average # Daily Motor Vehicle Theft	Average # Daily Robbery	Average # Daily Theft
Chicago						
Sunday	249	51	1	41	38	183
Monday	214	71	1	46	38	208
Tuesday	214	71	1	45	38	210
Wednesday	218	70	1	46	38	211
Thursday	217	71	1	47	37	209
Friday	222	74	1	49	39	227
Saturday	238	54	2	43	38	208
Houston						
Sunday	34	47	1	31	25	156
Monday	25	73	0	32	24	180
Tuesday	23	72	0	31	22	181
Wednesday	23	74	0	31	22	182
Thursday	23	71	0	31	21	181
Friday	26	78	0	33	25	193
Saturday	31	55	1	33	27	180
Philadelphia						
Sunday	27	24	1	11	22	90
Monday	23	34	1	14	23	115
Tuesday	23	33	1	13	23	109
Wednesday	23	30	1	13	23	109
Thursday	23	30	1	12	23	107
Friday	24	30	1	13	24	107
Saturday	26	25	1	12	23	95
Seattle						
Sunday	8	10	0	8	3	38
Monday	6	15	0	8	3	40
Tuesday	6	14	0	7	3	40
Wednesday	6	14	0	7	3	41
Thursday	6	14	0	7	3	40
Friday	7	16	0	8	3	45
Saturday	8	12	0	8	3	44

Table 18: Summary of Average Daily Crimes by Type on Federal Holidays versus Regular Days from 2009 to 2013

	Average # Daily Assault	Average # Daily Burglary	Average # Daily Homicide	Average # Daily Motor Vehicle Theft	Average # Daily Robbery	Average # Daily Theft
Chicago						
Regular Day	225	66	1	46	209	38
Federal Holiday	218	57	1	43	184	35
Houston						
Regular Day	26	67	1	32	180	24
Federal Holiday	29	59	0	27	147	22
Philadelphia						
Regular Day	24	30	1	12	105	23
Federal Holiday	25	27	1	11	86	21
Seattle						
Regular Day	7	14	0	8	41	3
Federal Holiday	7	13	0	7	38	3

Table 19: Summary of Average Daily crimes by Type on Observances versus Regular Days from 2009 to 2013

	Average # Daily Assault	Average # Daily Burglary	Average # Daily Homicide	Average # Daily Motor Vehicle Theft	Average # Daily Robbery	Average # Daily Theft
Chicago						
Regular Day	224	66	1	46	38	209
Observance	233	60	2	41	38	176
Houston						
Regular Day	26	67	1	32	24	180
Observance	30	57	1	27	25	146
Philadelphia						
Regular Day	24	30	1	12	23	105
Observance	25	24	1	11	20	88
Seattle						
Regular Day	7	14	0	8	3	41
Observance	7	13	0	7	3	38

Table 20 shows the average number of daily crimes by type and season. In general, a higher average number of crimes were observed in the summer across locations. The biggest differences between summer and winter were found in Chicago and Houston, with an average of 57 and 56 additional crimes per day in the summer, respectively. In some cases, the average numbers of daily crimes were similar to those observed in the fall or in the spring. In Chicago, the number of average daily assaults was 248 in both the summer and the spring while the average daily motor vehicle thefts was 46 in the summer and fall. Similarly, in Houston, the average number of daily burglary and robbery crimes were 76 and 27 in the summer and fall, respectively. In Philadelphia, the average number of daily burglaries was 32 in the summer and fall, while the average number of daily robberies was higher in the fall than in the summer. In Seattle, the daily average number of burglaries was higher in the fall than in the summer. In most cases, the lowest numbers of average daily crimes were observed in the winter. When the number observed for the winter was not the lowest, it was equal to a different season in each study city with one exception, Philadelphia, where the lowest number of average daily motor vehicle thefts was in the spring.

Table 20: Summary of Average Daily Crime by Type and Season from 2009 to 2013

	Average # Daily Assault	Average # Daily Burglary	Average # Daily Homicide	Average # Daily Motor Vehicle Theft	Average # Daily Robbery	Average # Daily Theft
Chicago						
Fall	203	71	1	46	41	208
Spring	248	64	1	45	37	210
Summer	248	74	2	46	42	235
Winter	198	55	1	45	32	178
Houston						
Fall	27	76	1	34	27	196
Spring	26	62	1	29	21	169
Summer	31	76	1	37	27	203
Winter	21	55	0	26	20	147
Philadelphia						
Fall	22	32	1	13	25	108
Spring	26	27	1	11	22	106
Summer	27	32	1	13	24	116
Winter	21	26	1	12	21	88
Seattle						
Fall	7	16	0	8	3	46
Spring	6	13	0	7	3	38
Summer	8	14	0	9	3	48
Winter	5	12	0	7	2	34

Weather attributes are summarized by location and season in Table 21. The coldest average temperature was observed in Chicago and the warmest average temperature was observed in Houston. The highest and lowest amounts of daily precipitation were observed in Seattle with 4 mm in the fall and 1 mm in the summer. Chicago also had a high of 4 mm in the spring.

Tables 22 and 23 summarize heating and cooling degree days as a different way to look at criminal behaviors by temperature. Table 22 suggested how in Chicago, Philadelphia and Seattle, a majority of the days throughout study years were heating days. Table 23 examined the average number of daily crimes in cooling and heating degree days and suggested a higher average was observed for cooling degree days. Indeed, across crime types and locations, there were higher daily average numbers on cooling degree days with only three exceptions. These exceptions were for homicide in Philadelphia and robbery in Seattle, where the average daily number of crimes was the same on heating and cooling degree days; and, in Seattle, where the average number of daily burglaries was higher on heating degree days. This was likely due to the number of heating degree days in Seattle.

Table 21: Summary of Average Weather Attributes by Location and Season from 2009 to 2013

	Average Daily Max Temp (°C)	Average Daily Temp (°C)	Average Daily Apparent Temp (°C)	Average Daily Humidex	Average Daily Dew Point (°C)	Average Daily Visibility (Km)	Average Daily Wind Speed ($m\ s^{-1}$)	Average Daily Precipitation (mm)
Chicago								
Fall	12	8	3	6	2	14	4	2
Spring	19	14	11	14	6	15	4	4
Summer	28	23	23	28	15	15	3	3
Winter	2	-1	-7	-4	-6	13	4	2
Houston								
Fall	24	19	18	22	13	15	3	3
Spring	30	24	25	30	17	15	3	2
Summer	35	30	34	40	22	16	2	3
Winter	19	14	11	15	8	14	4	3
Philadelphia								
Fall	14	10	7	10	4	14	3	3
Spring	21	16	14	17	8	15	3	3
Summer	29	24	25	30	17	15	2	3
Winter	6	2	-3	-1	-5	14	4	3
Seattle								
Fall	12	9	7	9	7	14	2	4
Spring	16	12	10	12	8	16	2	2
Summer	24	19	18	21	13	16	2	1
Winter	9	6	3	5	4	14	2	3

Table 22: Summary of the Number of Heating and Cooling Degree Days by Location and Year

Location	Year	Degree Day Type	Number of Degree Days Per Year
Chicago	2009	cooling	102
		heating	263
	2010	cooling	125
		heating	240
	2011	cooling	111
		heating	254
	2012	cooling	130
		heating	236
	2013	cooling	122
		heating	243
Houston	2009	cooling	240
		heating	125
	2010	cooling	235
		heating	130
	2011	cooling	251
		heating	114
	2012	cooling	273
		heating	93
	2013	cooling	233
		heating	132
Philadelphia	2009	cooling	120
		heating	245
	2010	cooling	145
		heating	220
	2011	cooling	139
		heating	224
	2012	cooling	135
		heating	231
	2013	cooling	126
		heating	238
Seattle	2009	cooling	75
		heating	290
	2010	cooling	37
		heating	328
	2011	cooling	45
		heating	320
	2012	cooling	49
		heating	317
	2013	cooling	91
		heating	274

Note: Degree Day data is missing for Philadelphia for two days in 2011 and one day in 2013 due to missing temperature data.

Table 23: Summary of Average Daily Crime Incidents by Location and Degree Day from 2009 to 2013

	Average # Daily Assault	Average # Daily Burglary	Average # Daily Homicide	Average# Motor Vehicle Theft	Average # Daily Robbery	Average # Daily Theft
Chicago						
Cooling	256	72	2	46	41	231
Heating	209	63	1	45	37	197
Houston						
Cooling	28	70	1	33	25	187
Heating	22	62	0	29	22	164
Philadelphia						
Cooling	27	31	1	13	24	114
Heating	22	28	1	12	22	99
Seattle						
Cooling	8	13	0	8	3	46
Heating	6	14	0	7	3	40

Daily average air pollution concentrations are summarized by season and location in Table 24. The highest average concentrations of SO_2 occurred in the winter in Chicago, Houston and Philadelphia with an average concentration of 5.1, 4.5 and 6.3 parts per billion respectively. SO_2 values were low and comparable in three of four seasons with winter concentrations slightly higher in Chicago, Houston and Philadelphia. The highest average concentrations of NO_2 were also observed in the winter in Chicago, Houston and Philadelphia with 39.4, 29.3, and 37.2 parts per billion, respectively. Average daily $PM_{2.5}$ and PM_{10} were highest in the summer in Chicago and in Houston. In Philadelphia, the average daily concentration of $PM_{2.5}$ was highest in the summer and for PM_{10} was highest in the spring. In Seattle, the average daily concentration of $PM_{2.5}$ was highest in the fall.

Table 25 summarizes the air pollution concentration distribution of each pollutant for the study period (2009 to 2013) with a comparison to the U.S. EPA National Ambient Air Quality Standards (NAAQS) (EPA, 2015e). The quartiles for CO were far below the standard even at the maximum observed concentration across study locations. The concentrations observed for NO_2 were below the NAAQS for the 75% percentile or 3rd quartile but exceeded the NAAQS across locations for the maximum observed concentrations. The maximum concentrations of O_3 exceeded the NAAQS in Chicago, Houston and Philadelphia. The median $PM_{2.5}$ concentration in Chicago was close to the NAAQS and the 75% percentile or 3rd quartile, and maximum concentration, exceeded the NAAQS. Similarly, concentrations in Houston and Philadelphia also exceeded the NAAQS for the 3rd and 4th quartile and for the 4th quartile for Seattle. The maximum concentrations observed for PM_{10} and SO_2 were below the NAAQS across study locations.

Table 26 summarizes the daily average air quality index (AQI) by season and location. These averages were similar to those observed for air pollution concentrations.

Table 24: Summary of Average Daily Air Pollution Concentration by Location and Season from 2009 to 2013

	Average Daily CO (ppm) Concentration	Average Daily NO_2 (ppb) Concentration	Average Daily O_3 (ppb) Concentration	Average Daily $PM_{2.5}$ (μg/m^3) Concentration	Average Daily PM_{10} (μg/m^3) Concentration	Average Daily SO_2 (ppb) Concentration
Chicago						
Fall	0.52	33.3	20	11.6	22.2	4.2
Spring	0.49	35.3	40	11.1	24.9	4.0
Summer	0.42	33.4	50	12.8	29.3	4.5
Winter	0.52	39.4	20	13.4	23.6	5.1
Houston						
Fall	0.45	28.6	30	10.3	26.5	3.6
Spring	0.32	20.8	40	12.1	33.1	2.5
Summer	0.31	18.4	40	12.9	37.1	2.6
Winter	0.44	29.3	30	10.8	27.8	4.5
Philadelphia						
Fall	0.49	32.7	20	10.2	20.7	4.0
Spring	0.33	29.7	40	9.3	27.3	3.8
Summer	0.32	26.0	50	11.9	26.4	3.8
Winter	0.47	37.2	30	11.7	25.1	6.3
Seattle						
Fall	0.48	-	20	8.8	-	2.5
Spring	0.32	-	30	6.0	-	3.3
Summer	0.29	-	30	7.9	-	5.9
Winter	0.52	-	20	7.7	-	2.9

NOTE: “-“ means data were not available for these pollutants for Seattle, Washington during study time period.

Table 25: Quartile Summary by Location and Air Pollutant from 2009 to 2013

Pollutant	National Ambient Air Quality Standard		Quartiles	Location			
	Level	Average Timing		Chicago	Houston	Philadelphia	Seattle
CO	9 ppm	8-hour	0% (Minimum)	0.1	0.2	0.2	0.1
			25% Quartile	0.3	0.3	0.3	0.2
			50% Quartile (Median)	0.5	0.3	0.3	0.3
			75% Quartile	0.6	0.4	0.4	0.4
			100% (Maximum)	1.8	1.8	1.8	2.8
NO_2	53 ppb	Annual	0% (Minimum)	3.0	3.6	3.5	-
			25% Quartile	27.0	14.5	14.5	-
			50% Quartile (Median)	34.6	22.7	22.7	-
			75% Quartile	42.6	33.0	32.9	-
			100% (Maximum)	87.5	54.6	60.7	-
O_3	0.075 ppm	8-hour	0% (Minimum)	0.003	0.007	0.006	0.002
			25% Quartile	0.02	0.03	0.03	0.02
			50% Quartile (Median)	0.03	0.03	0.03	0.027
			75% Quartile	0.04	0.04	0.04	0.033
			100% (Maximum)	0.09	0.1	0.1	0.05
$PM_{2.5}$	12 $\mu g/m^3$	Annual	0% (Minimum)	2.4	2.6	2.5	1.5
			25% Quartile	7.9	8.5	8.5	5.0
			50% Quartile (Median)	11.0	10.7	10.8	6.5
			75% Quartile	15.1	13.8	13.8	9.2
			100% (Maximum)	43.1	31.5	31.5	37
PM_{10}	150 $\mu g/m^3$	24-hour	0% (Minimum)	4.0	0	4.8	-
			25% Quartile	15.0	2.2	21.0	-
			50% Quartile (Median)	22.0	10.2	28.0	-
			75% Quartile	31.5	27.0	38.0	-
			100% (Maximum)	109	129	129	-
SO_2	75 ppb	1-hour	0% (Minimum)	0	0	0	0.2
			25% Quartile	2.0	0.9	0.8	0.9
			50% Quartile (Median)	3.7	2.4	2.2	1.9
			75% Quartile	6.0	4.8	4.6	4.4
			100% (Maximum)	29.0	22.8	38.4	52.7

(EPA, 2015e)

Table 26: Summary of Average Daily Air Quality Index (AQI) by Location and Season from 2009 to 2013

	Average Daily CO AQI	Average Daily NO_2 AQI	Average Daily O_3 AQI	Average Daily $PM_{2.5}$ AQI	Average Daily PM_{10} AQI	Average Daily SO_2 AQI
Chicago						
Fall	6	31	20	44	20	6
Spring	6	33	37	43	23	6
Summer	5	32	42	48	27	6
Winter	6	37	21	49	22	7
Houston						
Fall	5	27	29	41	24	5
Spring	3	19	37	47	30	3
Summer	3	17	35	49	33	3
Winter	5	27	26	43	25	6
Philadelphia						
Fall	5	30	20	39	19	5
Spring	3	28	38	37	25	5
Summer	3	24	44	45	24	5
Winter	5	35	24	44	23	8
Seattle						
Fall	5	-	17	35	-	3
Spring	3	-	29	25	-	4
Summer	3	-	21	32	-	8
Winter	6	-	20	31	-	3

Variance was considered to determine if models joining data from the four study locations could be combined and presented as one dataset. Table 27 shows the variance by city and crime type in relation to air pollution concentrations. Results suggested the variance was low for $PM_{2.5}$, SO_2, NO_2 and PM_{10}. However, for CO and O_3, there were larger variances between cities. As such, only 12 of the 14 models are presented. In this study, final models, regardless of variance, have corrected for location to ensure the parameters would not be affected even if large variances were present.

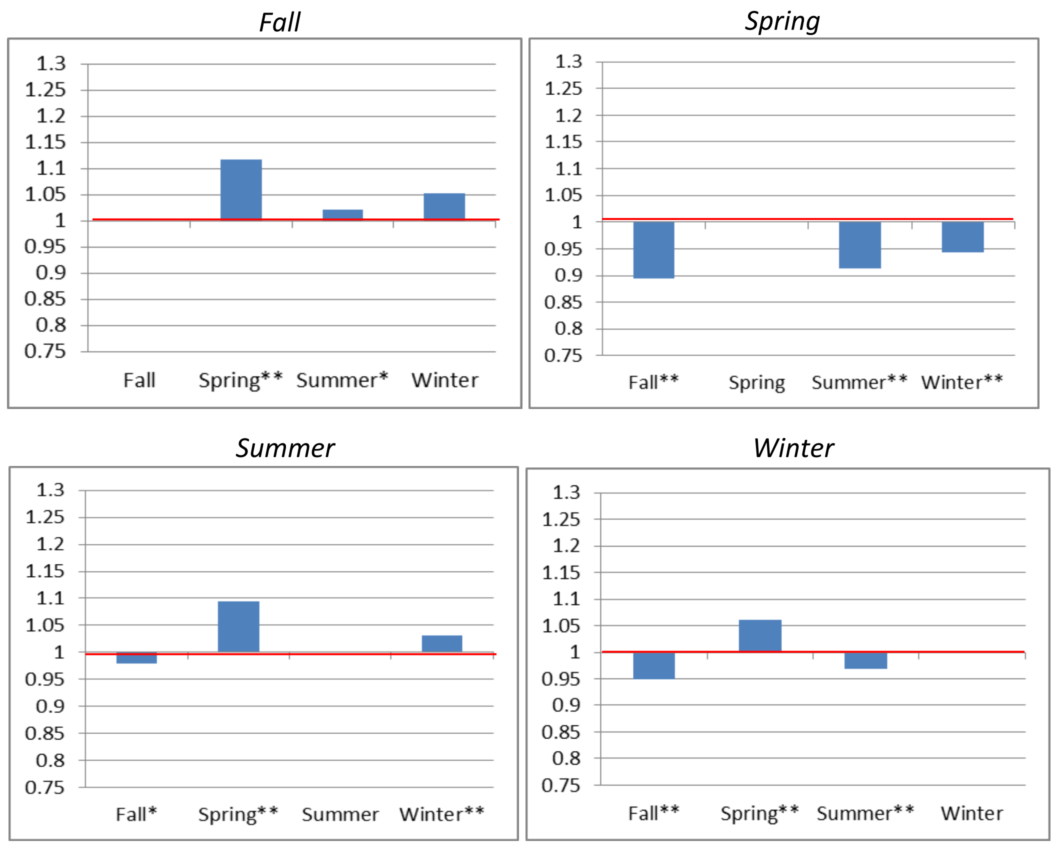
Table 27: Air Pollution Variance between Cities by Crime Type

	Assault	**Burglary**	**Homicide**	**Motor Vehicle Theft**	**Robbery**	**Theft**
CO						
Chicago	0.002	0.034	0.010	0.002	0.007	0.016
Houston	0.008	0.005	0.091	0.008	0.005	0.007
Philadelphia	0.001	0.002	0.061	0.095	0.001	0.011
Seattle	4.739	3.128	1.049	1.233	2.154	3.377
Ozone						
Chicago	0.224	0.099	2.639	0.263	0.175	0.046
Houston	1.015	1.200	32.454	1.275	5.486	0.754
Philadelphia	1.444	0.508	8.608	17.269	0.360	0.134
Seattle	10.641	33.942	156.640	23.686	18.039	12.178
$PM_{2.5}$						
Chicago	0.000002	5.86E-07	1.71E-05	7.23333E-07	5.76E-07	8.56E-07
Houston	0.000008	7.84E-06	0.0001	0.000007	2.12E-05	5.32E-06
Philadelphia	0.000008	7.79E-06	0.0001	2.89358E-05	3.74E-06	1.77E-06
Seattle	0.00128	0.001	0.0010	0.0006	0.001	0.001443
SO_2						
Chicago	7.83E-07	1.64E-05	1.67E-05	5.71583E-06	1.21E-06	1.14E-06
Houston	1.08E-05	7.87E-06	0.0001	0.0002	7.87E-05	2.26E-05
Philadelphia	1.16E-05	1.05E-05	6.38E-05	7.41733E-05	1.56E-05	1.02E-05
Seattle	1.06E-05	8.74E-05	0.000575	0.0002	0.0001	4.31E-05
NO_2						
Chicago	8.83E-08	2.45E-07	1.09E-05	8.18333E-07	3.43E-07	1.78E-07
Houston	3.02E-06	1.21E-05	6.13E-05	4.23333E-06	6.85E-06	2.4E-06
Philadelphia	8.98E-07	2.85E-06	5.78E-05	0.0001	2.75E-06	3.15E-07
PM_{10}						
Chicago	5.83E-08	3.28E-07	5.38E-06	0.0000003	2E-07	-0.0017
Houston	1.46E-06	1.26E-06	3.44E-05	0.000002	1.46E-06	6.88E-07
Philadelphia	4.8E-07	4.85E-07	7.61E-06	0.00004	1.12E-06	7.68E-07

Poisson regression was completed to compare the relative risk of crimes by season. These results are reported in Figures 11a-f and are based on the regression model combining study locations and correcting for differences by location. Assault crimes were most likely to happen in the spring with statistically significant ($p<.0001$) increases in crime rates ranging from 5% to 12%. Burglary crimes were more likely to occur in the fall with 5% to 27% statistically significant ($p<.0001$) increases. Homicide cases were most likely to occur in the winter; however, these findings were only significant ($p\leq0.05$) when comparing the increases between summer and winter. Motor vehicle theft, robbery and theft crimes each had similar statistically significant ($p<.0001$) increases in crime in the fall and summer seasons.

The relative risk of increased crimes was also compared by day of the week based on the model combining study locations. These results are reported in Figures 12a-f. Assault crimes were most likely to occur on a Sunday ($p<.0001$), closely followed by Saturday ($p<.0001$). Similar increases were observed for homicide crimes. Burglaries had increased crime rates on Friday, closely followed by Monday and the remaining days of the week with varying significance observed. A similar relationship was observed for motor vehicle theft crimes. Robbery crimes were most likely to occur on a Saturday, closely followed by Friday, while theft crimes were most likely to occur on a Friday ($p<.0001$).

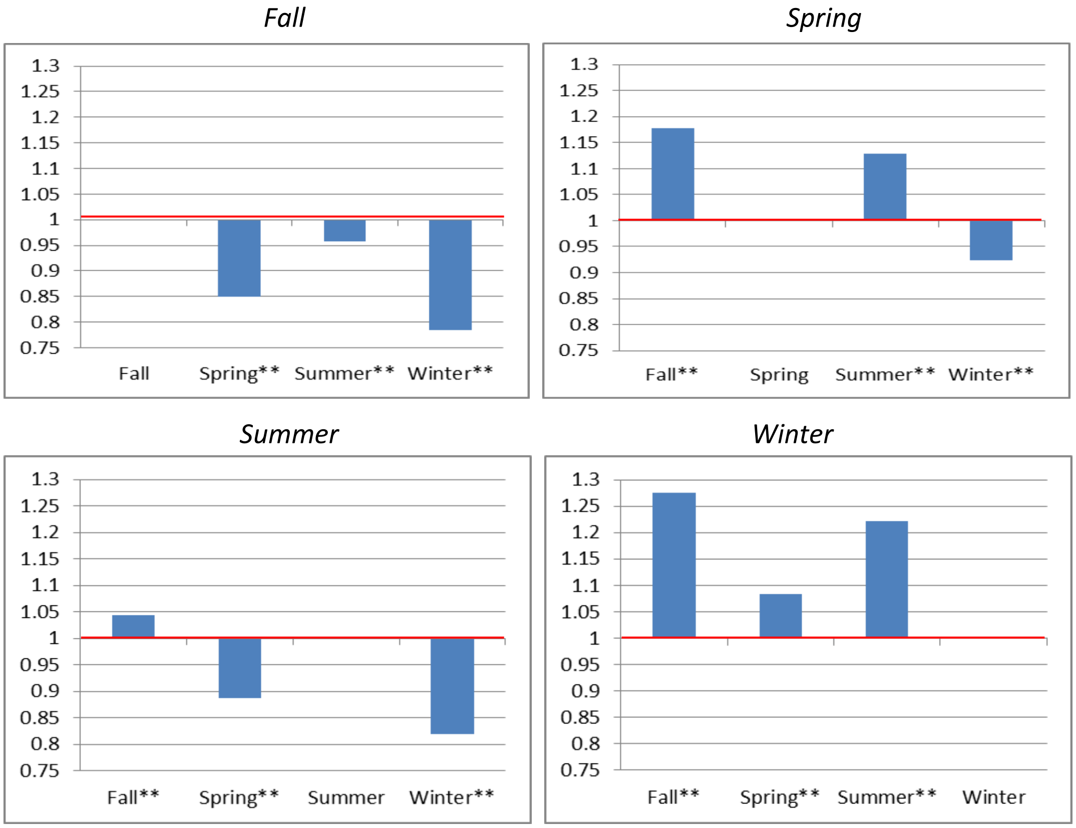
Figure 11a: Relative Risk of Assault Crimes by Season



* Indicates statistical significance (p≤0.05) **Indicates statistical significance (p<0.0001)

Note: No difference is indicated by a risk ratio of 1

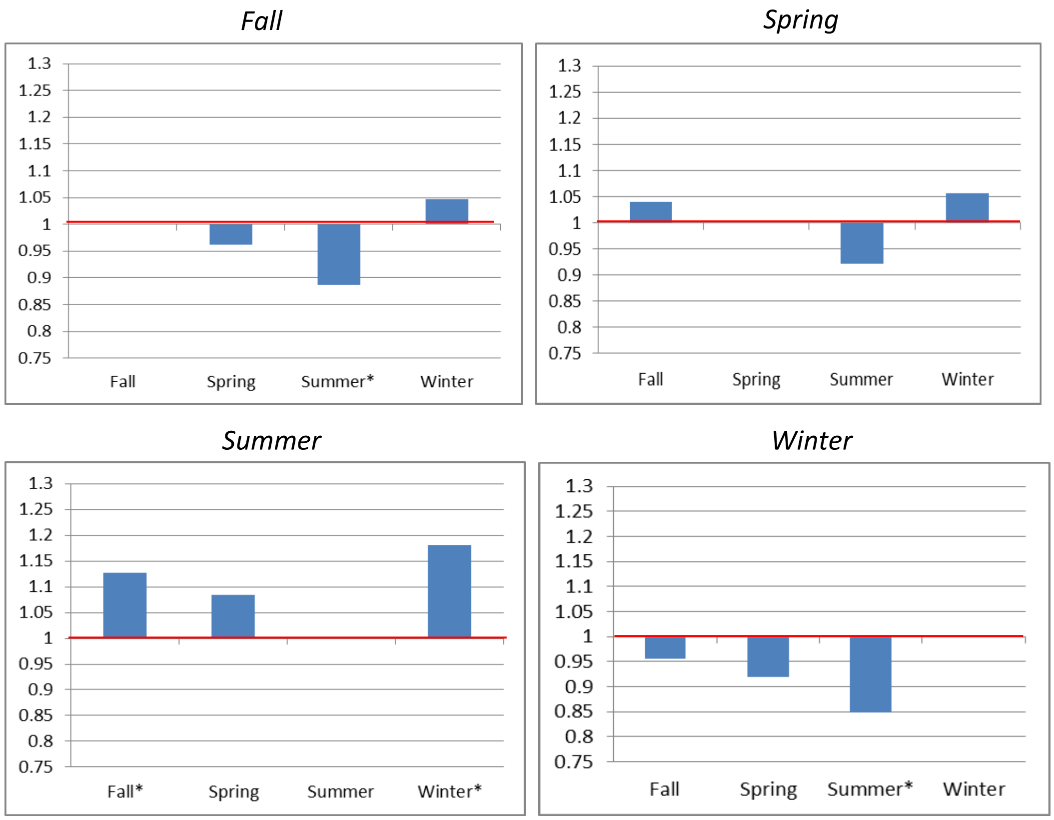
Figure 11b: Relative Risk of Burglary Crimes by Season



* Indicates statistical significance (p≤0.05) **Indicates statistical significance (p<0.0001)

Note: No difference is indicated by a risk ratio of 1

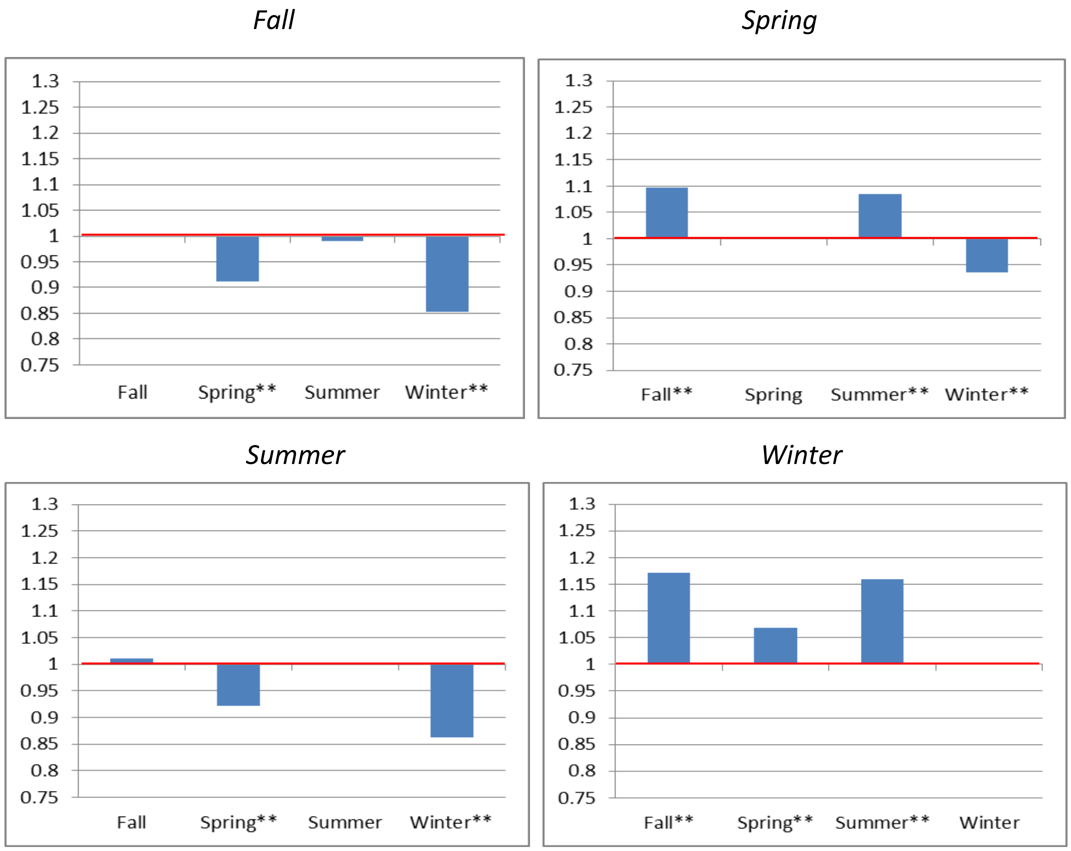
Figure 11c: Relative Risk of Homicide Crimes by Season



* Indicates statistical significance ($p \leq 0.05$)

Note: No difference is indicated by a risk ratio of 1

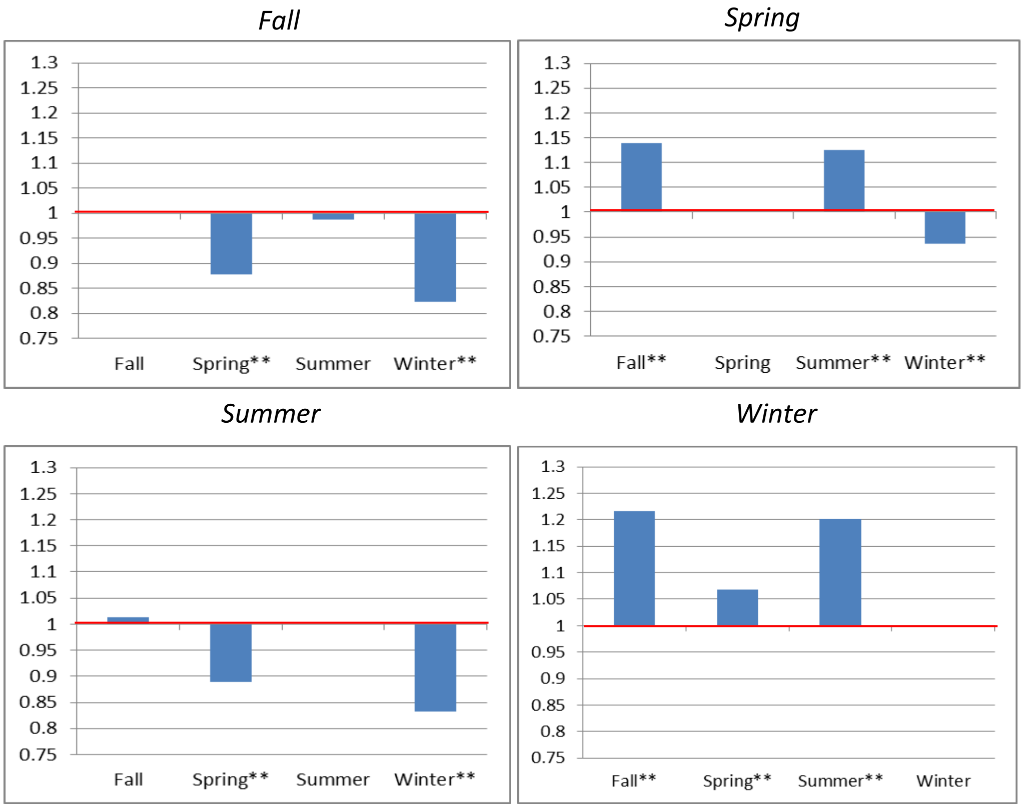
Figure 11d: Relative Risk of Motor Vehicle Theft Crimes by Season



* Indicates statistical significance (p≤0.05) **Indicates statistical significance (p<0.0001)

Note: No difference is indicated by a risk ratio of 1

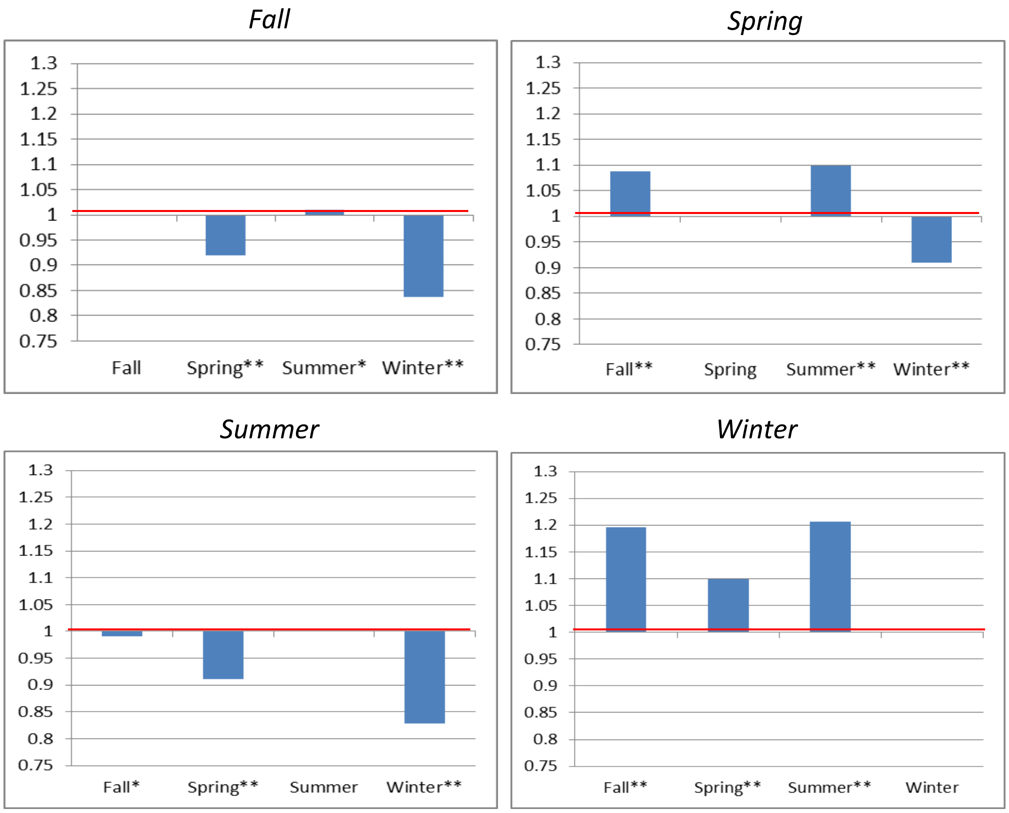
Figure 11e: Relative Risk of Robbery Crimes by Season



* Indicates statistical significance (p≤0.05) **Indicates statistical significance (p<0.0001)

Note: No difference is indicated by a risk ratio of 1

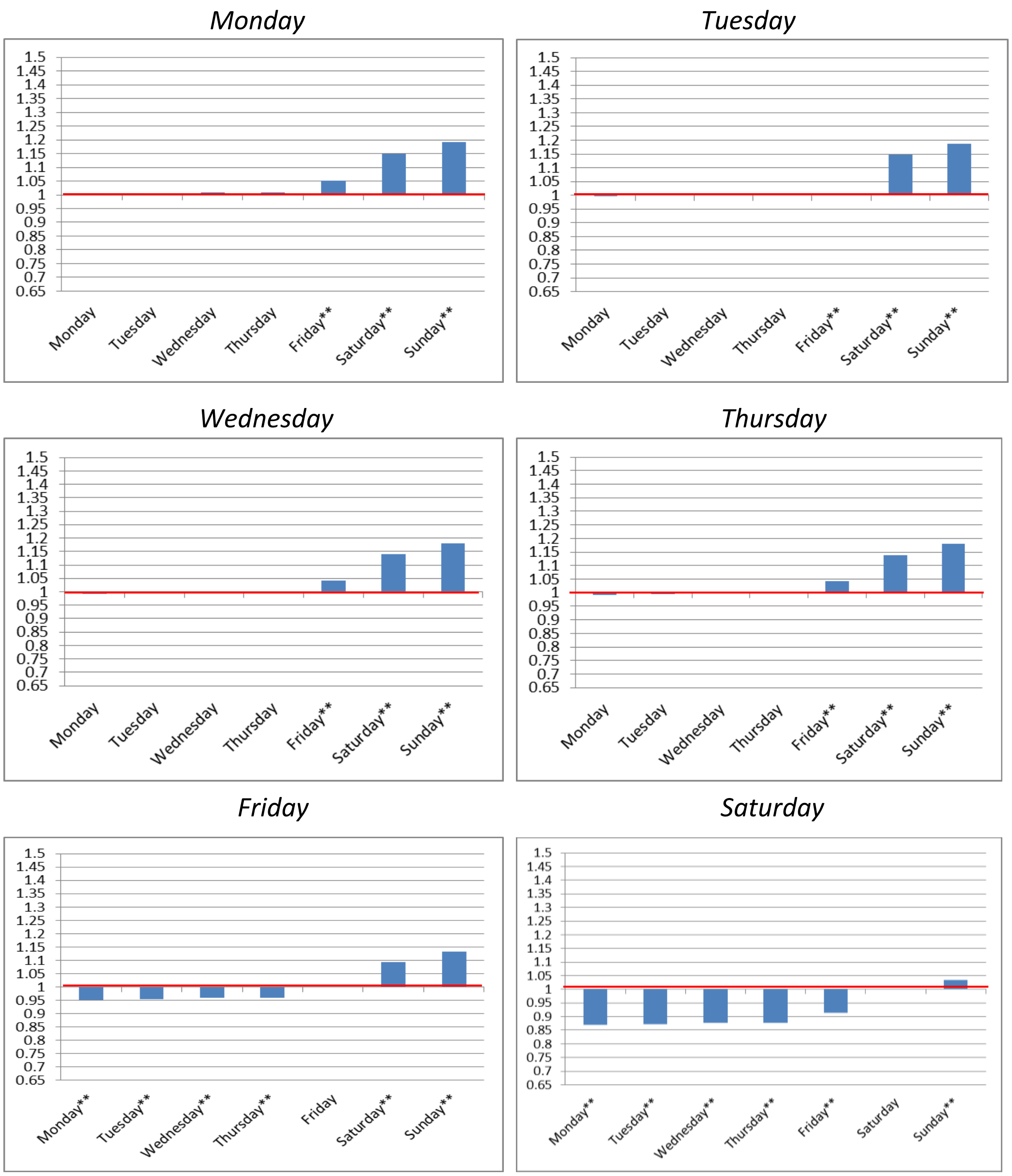
Figure 11f: Relative Risk of Theft Crimes by Season

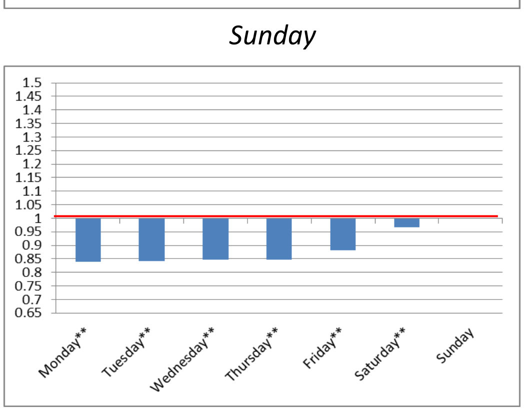


*Indicates statistical significance (p≤0.05) **Indicates statistical significance (p<0.0001)

Note: No difference is indicated by a risk ratio of 1

Figure 12a: Relative Risk of Assault Crimes by Day of the Week

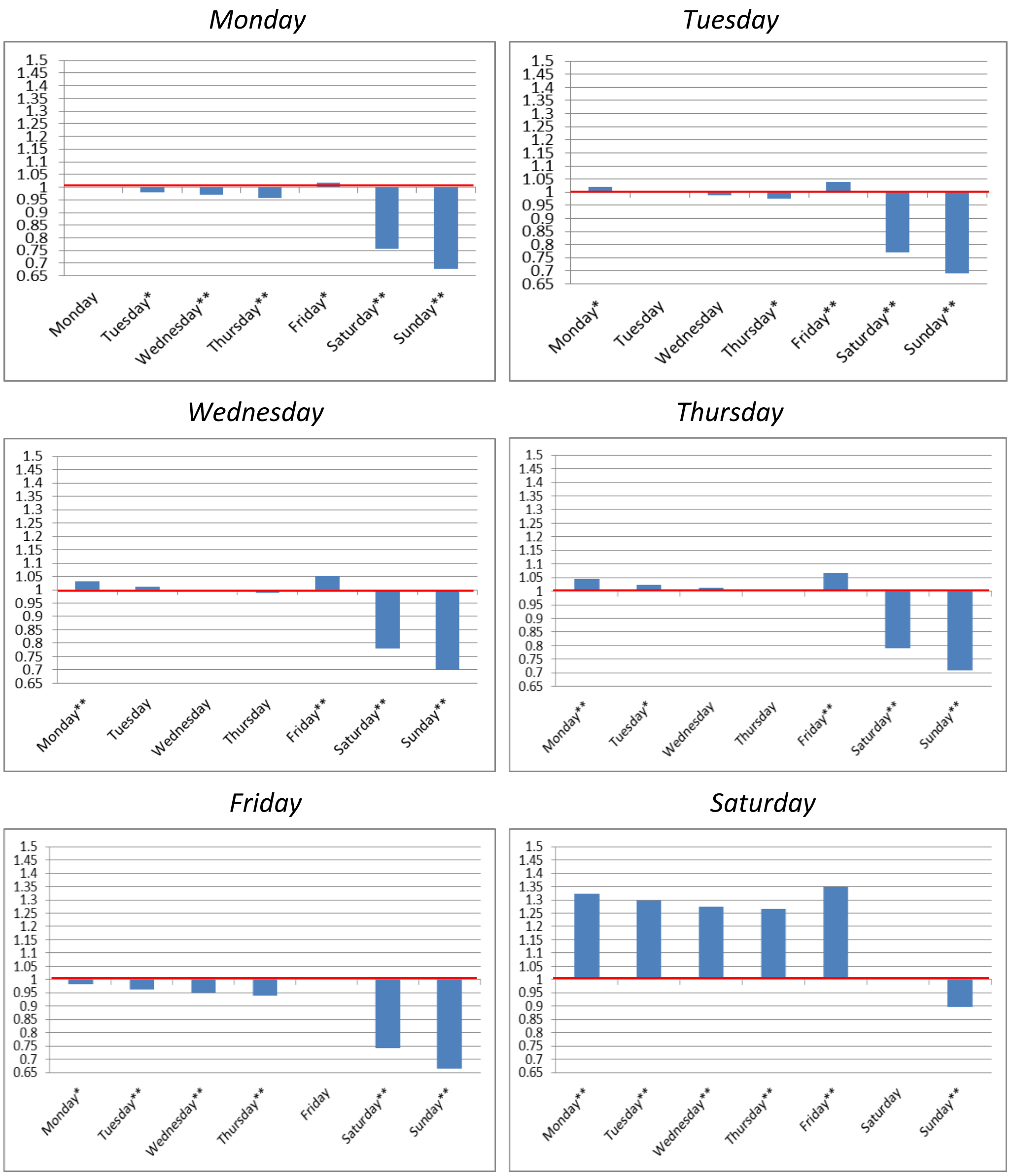


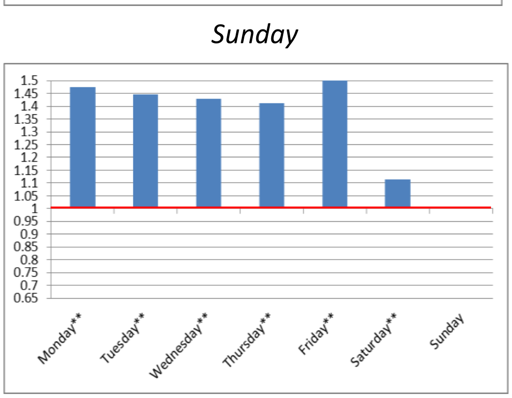


**Indicates statistical significance ($p<0.0001$)

Note: No difference is indicated by a risk ratio of 1

Figure 12b: Relative Risk of Burglary Crimes by Day of the Week

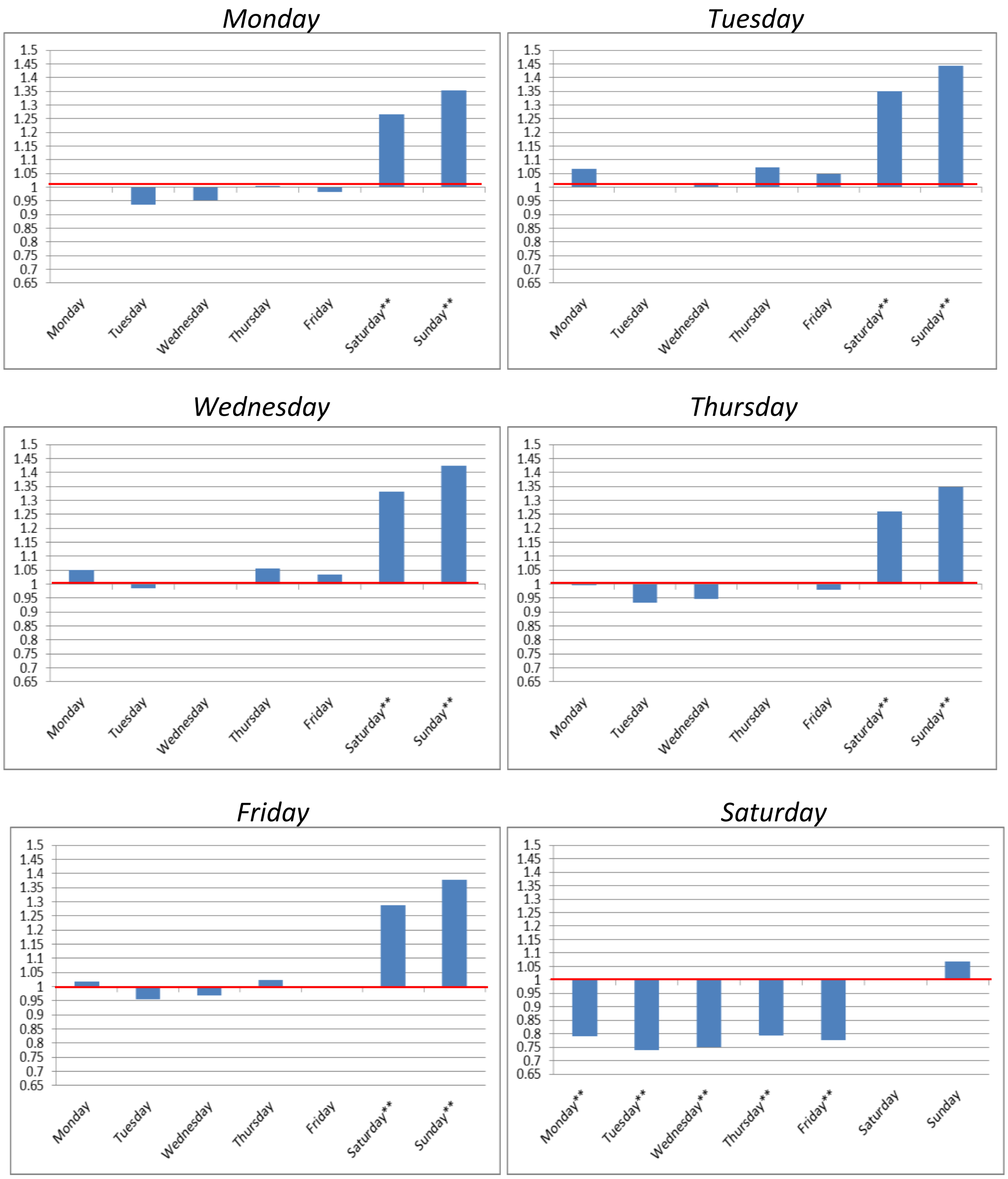


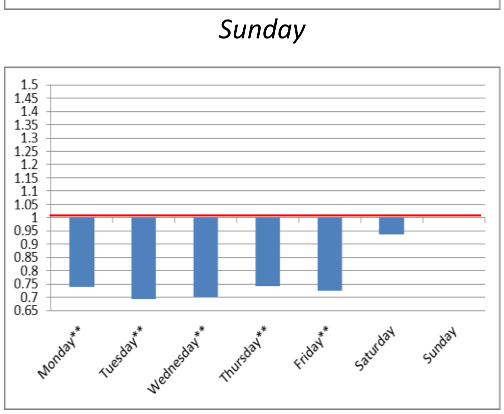


* Indicates statistical significance (p≤0.05)
**Indicates statistical significance (p<0.0001)

Note: No difference is indicated by a risk ratio of 1

Figure 12c: Relative Risk of Homicide Crimes by Day of the Week

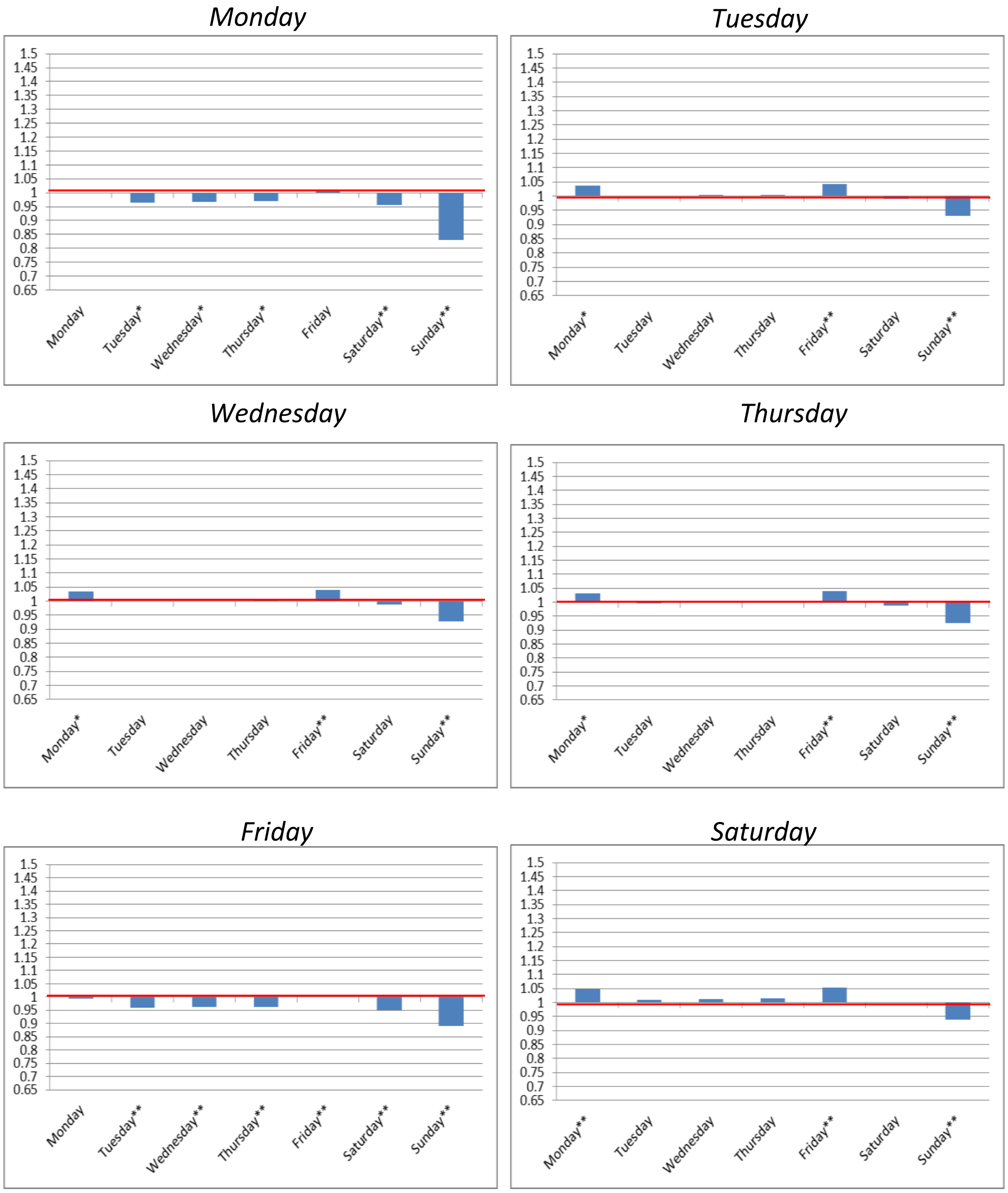


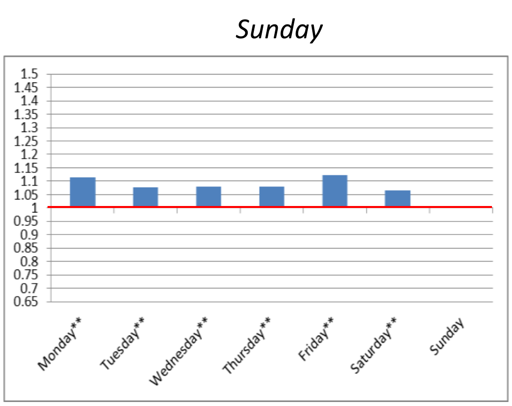


**Indicates statistical significance (p<0.0001)

Note: No difference is indicated by a risk ratio of 1

Figure 12d: Relative Risk of Motor Vehicle Theft Crimes by Day of the Week



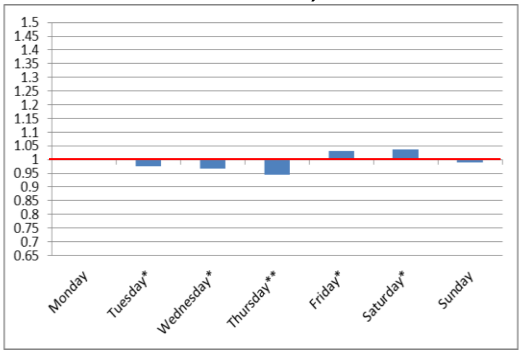


* Indicates statistical significance (p≤0.05)
**Indicates statistical significance (p<0.0001)

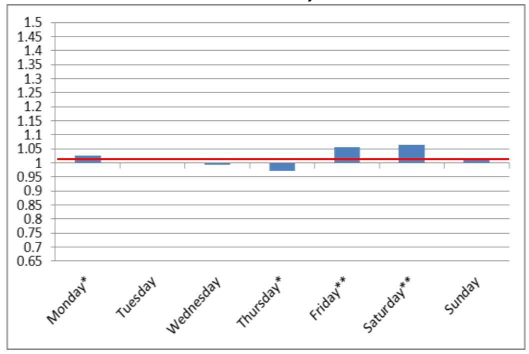
Note: No difference is indicated by a risk ratio of 1

Figure 12e: Relative Risk of Robbery Crimes by Day of the Week

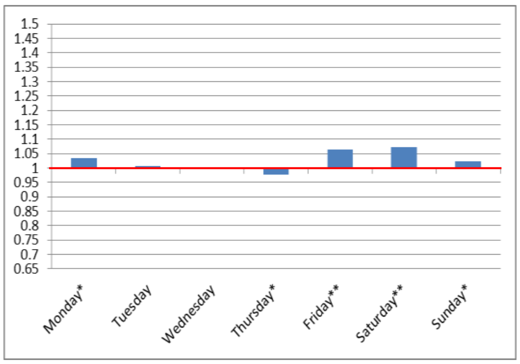
Monday



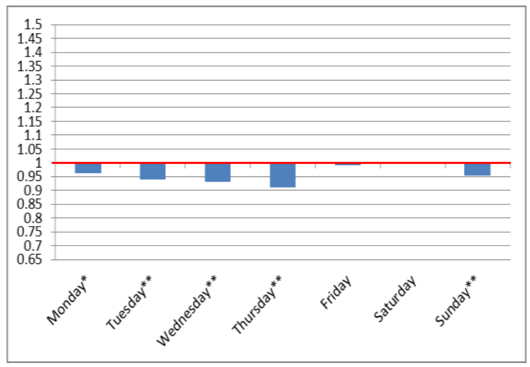
Tuesday



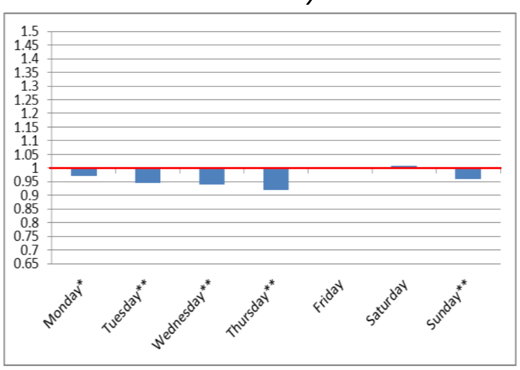
Wednesday



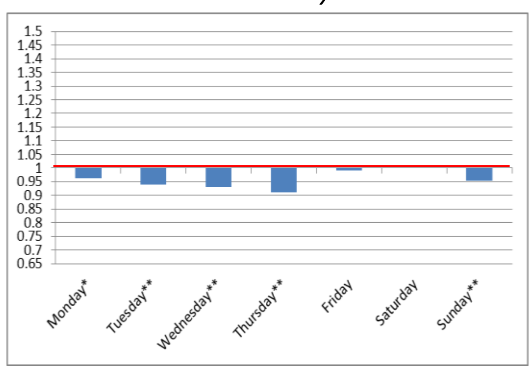
Thursday



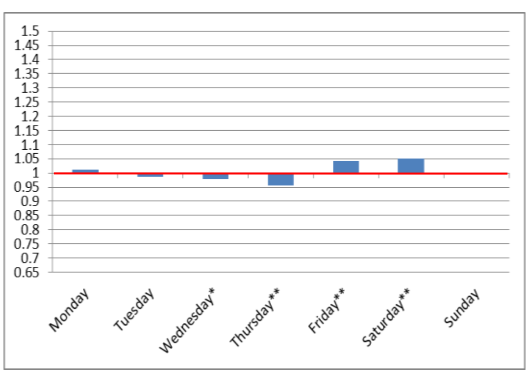
Friday



Saturday



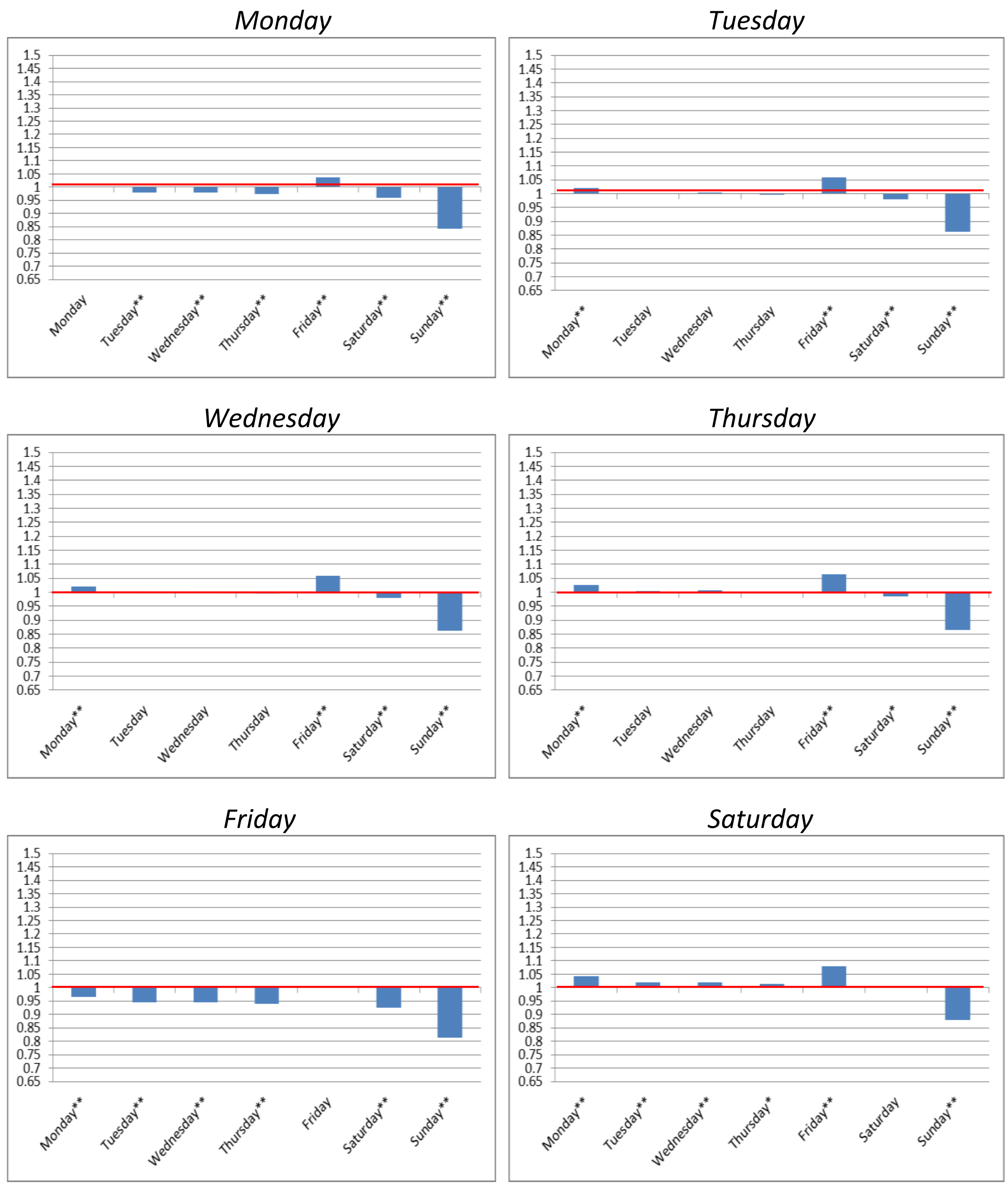
Sunday

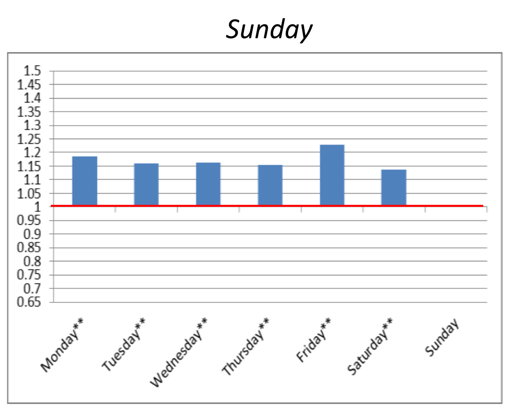


* Indicates statistical significance (p≤0.05)
**Indicates statistical significance (p<0.0001)

Note: No difference is indicated by a risk ratio of 1

Figure 12f: Relative Risk of Theft Crimes by Day of the Week



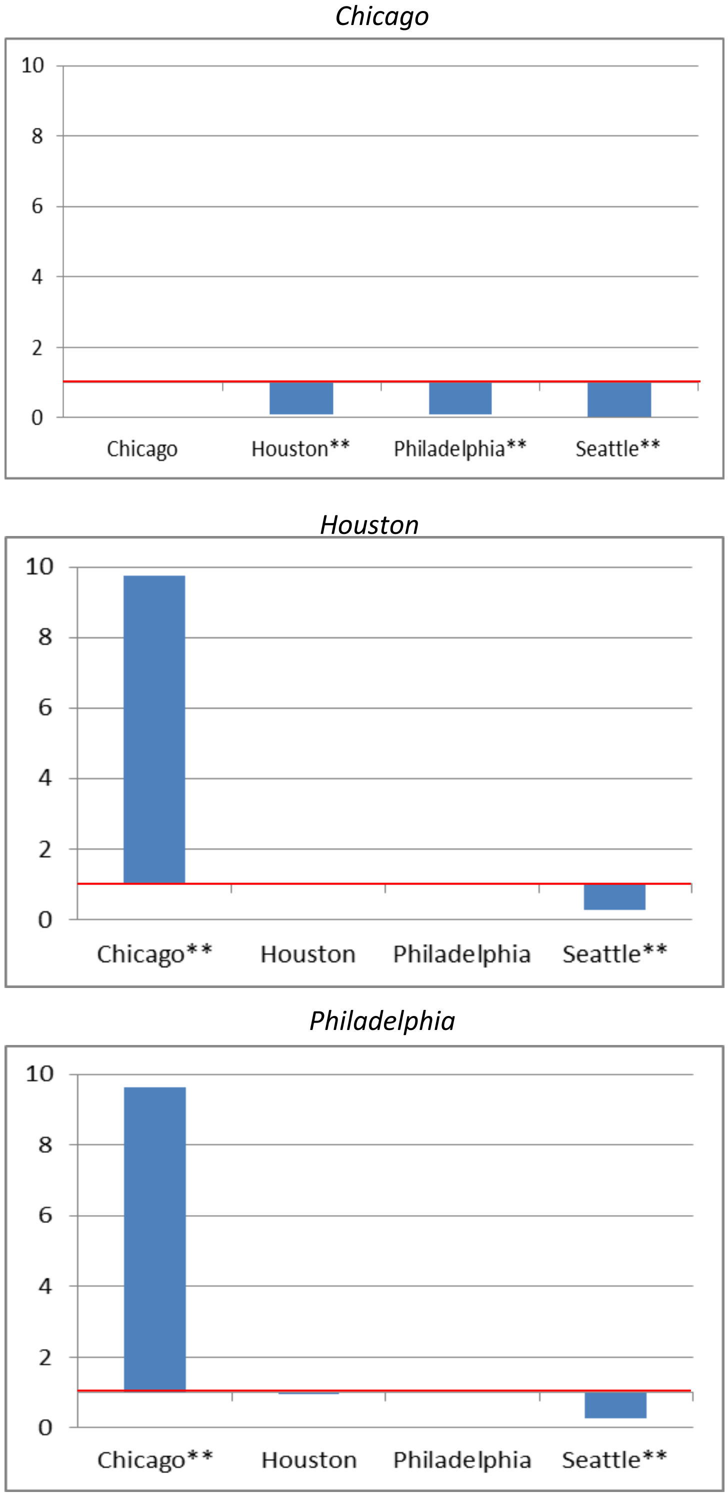


* Indicates statistical significance (p≤0.05)
**Indicates statistical significance (p<0.0001)

Note: No difference is indicated by a risk ratio of 1

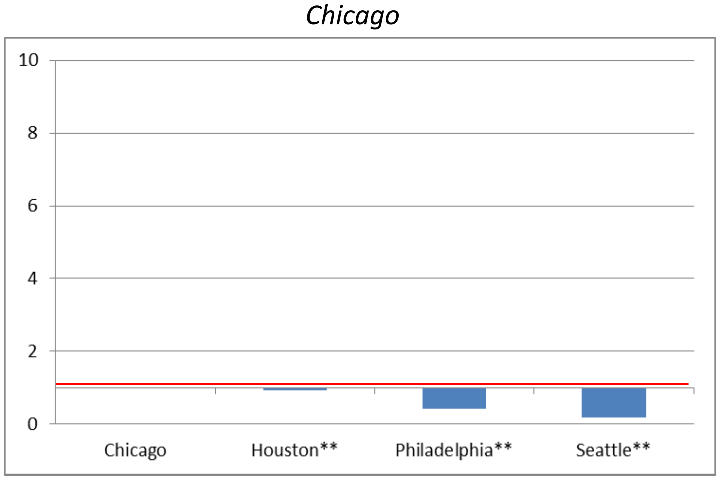
When comparing the relative risk of crimes by study location, each of the crime types examined in this study had a higher risk of occurring in Chicago, and were least likely to occur in Seattle. The comparisons by location and crime types are summarized in Figures 13a-f. These figures show the results for Chicago, Houston and Philadelphia held constant to show the differences between locations. Assaults were over 36 times more likely to occur in Chicago than Seattle, while burglaries were over five times more likely. When comparing the risk of burglaries in Philadelphia, they were over two times more likely in Chicago and Houston and almost 45% less likely in Seattle. Risk of homicide was more comparable between Chicago and Philadelphia with lower risks observed in Houston and Seattle. Motor vehicle thefts were over six times more likely in Chicago than Seattle and almost four times more likely than in Philadelphia. Robberies were 15 times more likely, and theft over five times more likely to occur in Chicago than Seattle. Theft and robbery crimes increases ranged between 25% and 107% when comparing Chicago to Houston and Philadelphia.

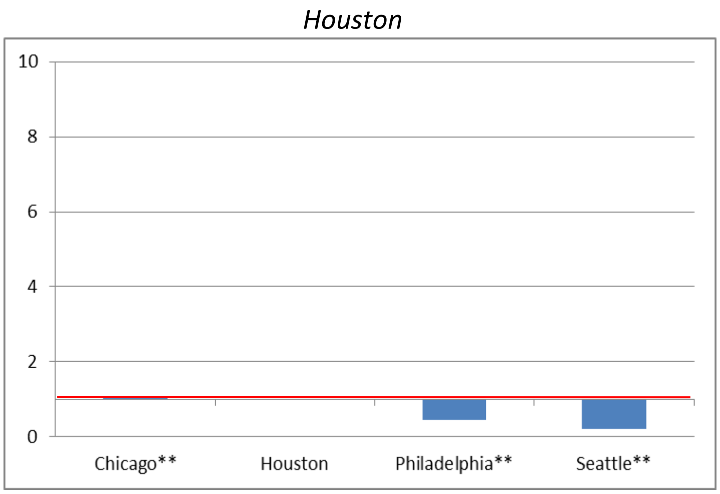
Figure 13a: Relative Risk of Assault Crimes by Location

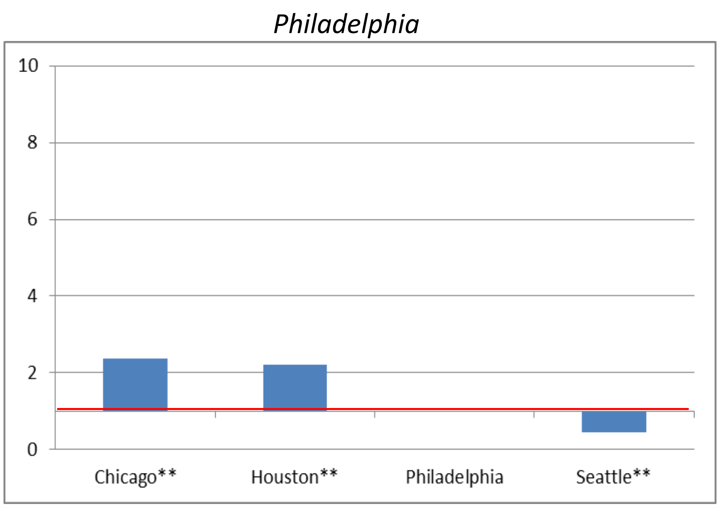


**Indicates statistical significance (p<0.0001) Note: No difference is indicated by a risk ratio of 1

Figure 13b: Relative Risk of Burglary Crimes by Location

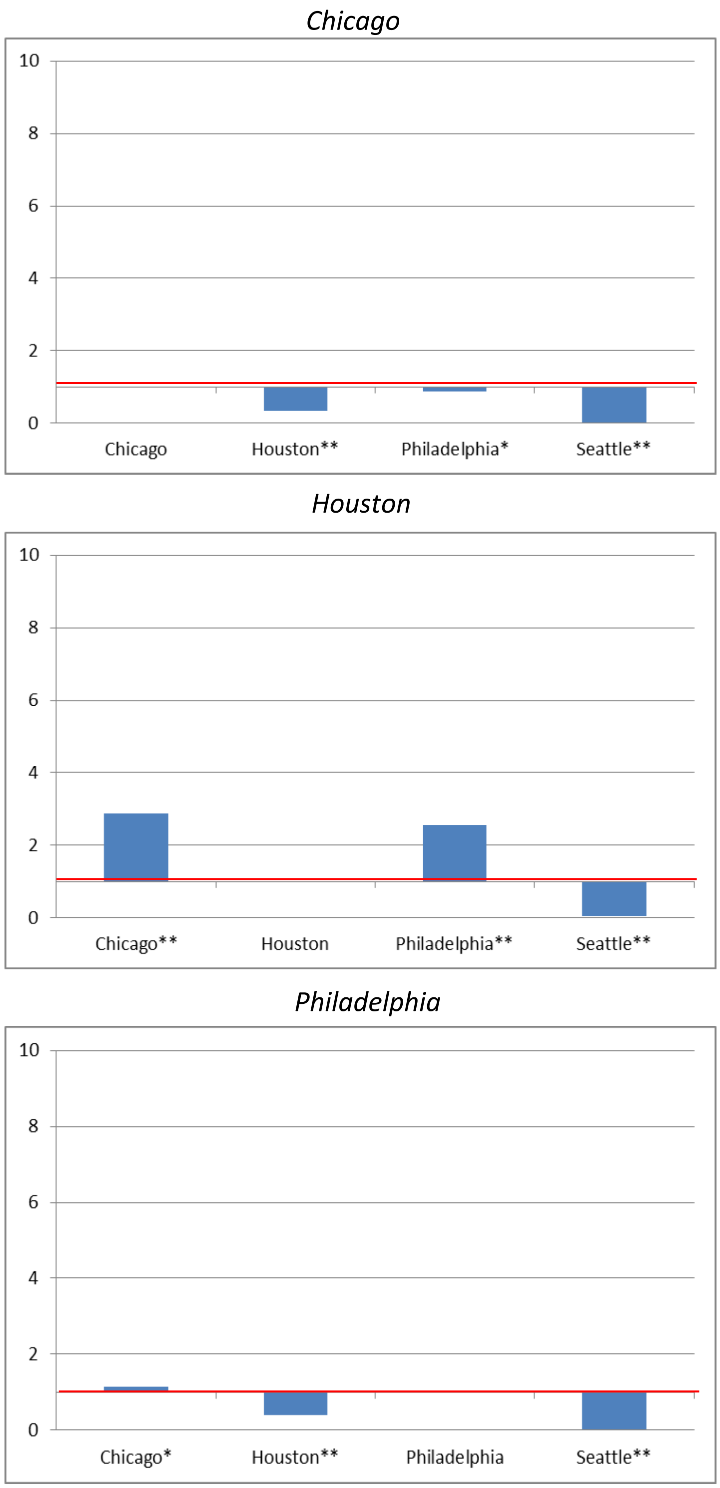






**Indicates statistical significance (p<0.0001) Note: No difference is indicated by a risk ratio of 1

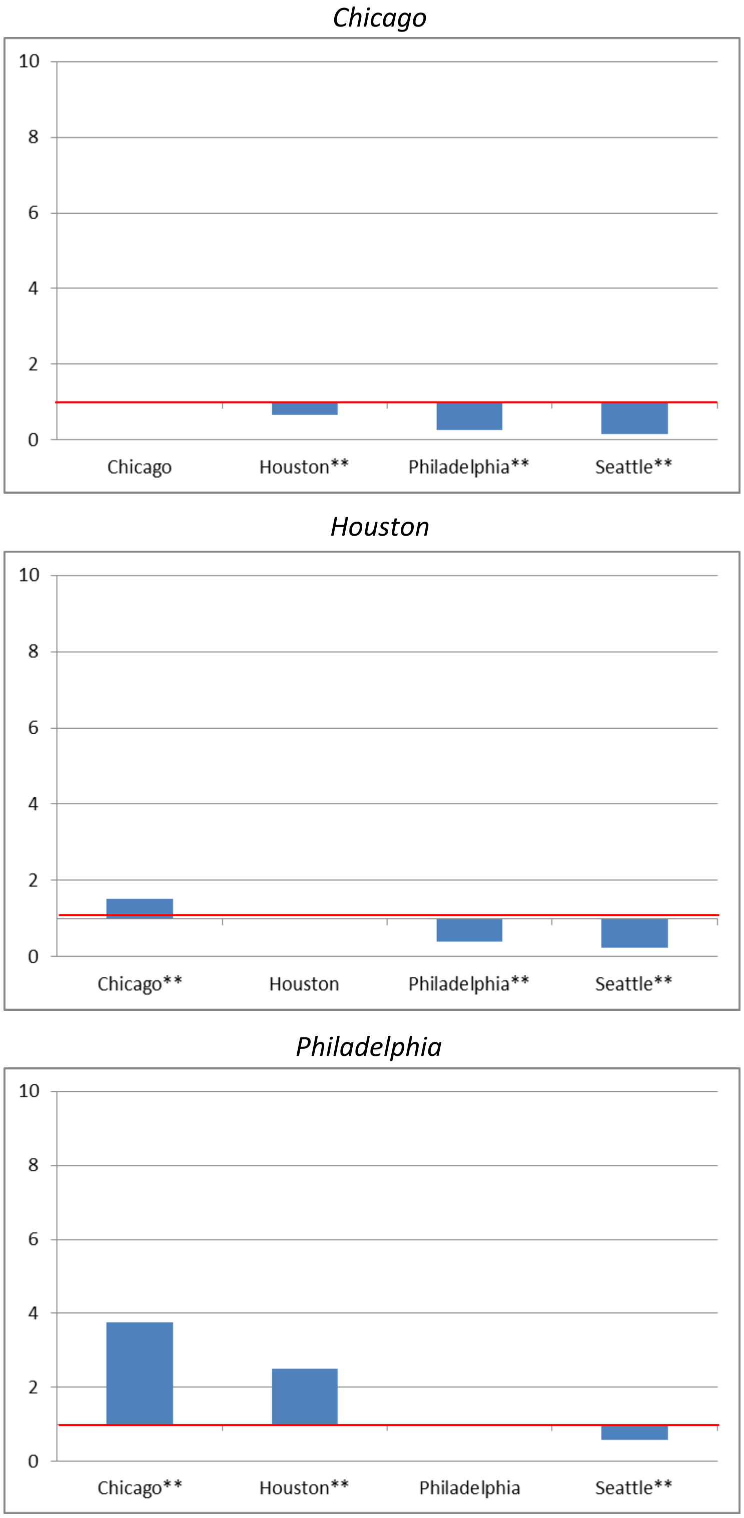
Figure 13c: Relative Risk of Homicide Crimes by Location



* Indicates statistical significance (p≤0.05) **Indicates statistical significance (p<0.0001)

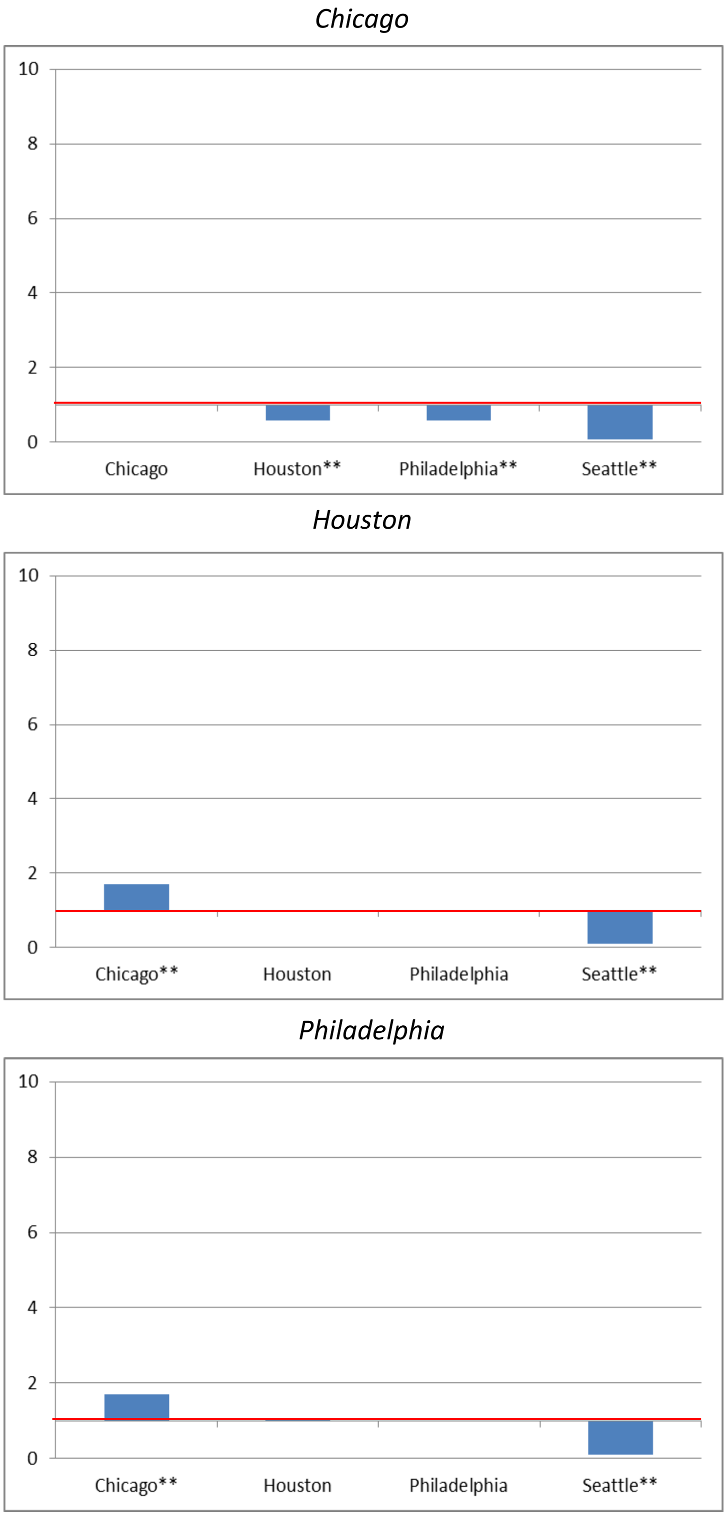
Note: No difference is indicated by a risk ratio of 1

Figure 13d: Relative Risk of Motor Vehicle Theft Crimes by Location



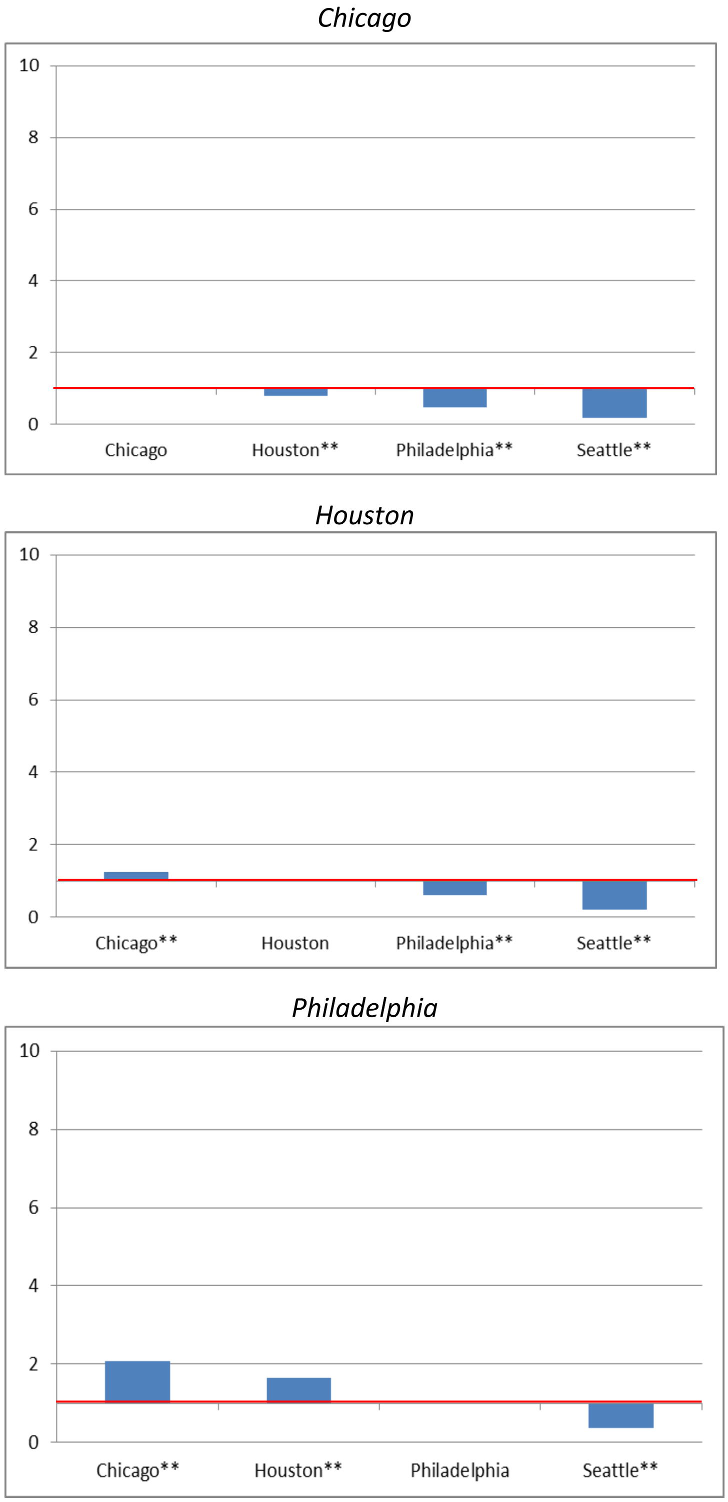
**Indicates statistical significance (p<0.0001) Note: No difference is indicated by a risk ratio of 1

Figure 13e: Relative Risk of Robbery Crimes by Location



**Indicates statistical significance (p<0.0001) Note: No difference is indicated by a risk ratio of 1

Figure 13f: Relative Risk of Theft Crimes by Location



**Indicates statistical significance (p<0.0001) Note: No difference is indicated by a risk ratio of 1

Tables 28 to 33 present results of the Poisson regression models for the data across study locations, including air pollutants and crime types available for multi-location models and all attibutes available for single location models. Each statistical model corrected for differences between season, day of the week and considered federal holidays and observances. See Appendix C for a complete list of holidays and observances included. Results for continuous variables are presented based on interquartile range (IQR) to compare the difference between the 25th percentile with the 75th percentile of measurements for each environmental parameter. Models with more than one city also corrected for location.

Table 28 presents results of the model across study locations. There was a 1.10 (CI: 1.04, 1.17) or 10% increase in assault crimes when CO concentrations were in the 75th percentile versus the 25th percentile. Likewise, there was a 1.03 (CI: 1.02, 1.03) or 3% increase in assault crimes when $PM_{2.5}$ concentrations were in the 75th percentile versus the 25th percentile. The highest incease in assault crimes was seen when apparent temperature was at the 75th percentile in comparison to the 25th percentile, with an increase of 1.70 (CI: 1.32, 2.18) or 70%. Wind speed and visibility also showed slight influences on increases in assault when comparing the 75th percentile to the 25th percentile, by 1.04 or 4% and 1.02 or 2%, respectively.

When looking at burglaries, higher CO levels appeared to result in a decrease in burglaries, with burglaries occuring 0.84 (CI: 0.77, 0.92) or 16% less often when CO concentrations were in the 75th percenticle compared to the 25th percentile. Burglaries increased by 1.03 or 3%, however, when the percentage of cloud cover was at the 75th

percentile versus 25th percentile . Motor vehicle theft had an inverse relationship when comparing data to humidex and apparent temperature calculations. The number of motor vehicle thefts increased by 3.79 (CI: 2.51, 5.73) or almost a factor of four for humidex increases while decreasing 0.29 (CI: 0.17, 0.39) or about 70% for apparent temperature increases. Similar to burglary, robbery crimes increased by 1.05 (CI: 1.02, 1.07) or 5% when cloud cover was higher. In addition, when the maximum daily eight-hour ozone concentrations reached the 75th percentile, compared to the 25th percentile, the number of robberies decreased by 0.96 (CI: 0.95, 0.98) or 4%.

Theft crimes decreased as CO and ozone increased 0.68 (CI: 0.63, 0.74) or 32% and 0.98 (CI: 0.97, 1.00) or 2% (with borderline statistical significance), respectively. Like motor vehicle theft crimes, theft crimes had an inverse relationship when compared to calculated humidex and apparent temperature values. However, the results were opposite, with theft crimes increasing by 1.58 (CI: 1.17, 2.14) or 58% when apparent temperature is at a higher IQR and decreasing by 0.67 (CI: 0.50, 0.90) or 33% at a higher IQR for humidex. Assault crimes increased by 1.06 (CI: 1.02, 1.09) or 6% on federal holidays while burglary, motor vehicle theft, robbery and theft decreased by 0.86 (CI: 0.81, 0.90) or 14%, 0.90 (CI: 0.85, 0.95) or 10%, 0.93 (CI: 0.88, 0.97) or 7%, and 0.87 (CI: 0.83, 0.90) or 13%, respectively.

Table 29 presents results for the model with Chicago, Houston and Philadelphia data. By removing Seattle, this model included two additional air pollutants, NO_2 and PM_{10}, and an additional crime category, rape and sex crimes. In this model, when PM_{10} was found to be significant, there was a minimal decrease in crime when PM_{10}

concentrations were at the 75th percentile in comparison to the 25th percentile. NO_2 was not found to impact crime incident rates, with no statistical significance identified for any of the crime categories evaluated in this study. There was a 1.27 (CI: 1.18, 1.37) or 27% increase in assault crimes when CO concentrations were in the 75th percentile versus the 25th percentile and 1.04 (CI:1.03, 1.05) or 4% for $PM_{2.5}$ concentrations in the 75th percentile versus the 25th percentile. Similar to the previous model, the highest increase in assault crimes was observed when apparent temperature was at the 75th percentile of the IQR in comparison to 25th percentile, with an increase of 2.46 (CI: 1.75, 3.54) or 146%.

Homicides and rape and sex crimes were found to increase during federal holidays, 1.34 (CI: 1.07, 1.68) or 34% and 1.61 (CI: 1.00, 1.82) or 61%, respectively. As was observed in the model across study locations, burglary, motor vehicle theft, robbery and theft decreased by 0.82 (CI: 0.77, 0.88) or 18%, 0.89 (CI: 0.83, 0.96) or 11%, 0.93 (CI: 0.88, 0.97) or 7%, and 0.87 (CI: 0.83, 0.90) or 13%, respectively. Thus, the results from this second model without Seattle are similar to those from the full model across study locations, but, in many cases, stronger. For example, motor vehicle theft had an inverse relationship when comparing humidex and apparent temperature. The number of motor vehicle thefts increased by over a factor of seven or 7.14 (CI: 3.92, 13.03) for humidex increases, while decreasing 0.14 (CI: 0.07, 0.25) or 86% apparent temperature increases.

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Table 28: Crime across Study Locations Considering Daily Air Pollution Concentrations and Environmental Parameters

Parameter		**Assault**			**Burglary**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**1.06**	**(1.02, 1.09)**	**0.0006**	**0.86**	**(0.81, 0.90)**	**<.0001**
Observances		1.03	(0.99, 1.07)	0.1706	1.04	(0.97, 1.10)	0.2661
Average of Daily 8-Hour Max CO (ppm)	*2.0*	**1.10**	**(1.04, 1.17)**	**0.0018**	**0.84**	**(0.77, 0.92)**	**0.0003**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.00	(0.99 1.01)	0.9232	1.00	(0.98, 1.01)	0.5853
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*6.5*	**1.03**	**(1.02, 1.03)**	**<.0001**	1.01	(0.99, 1.02)	0.3468
Average of Daily 1-Hour Max SO_2 (ppb)	*3.6*	1.00	(0.99, 1.01)	0.9117	1.00	(0.99, 1.01)	0.6236
Apparent Temperature (C)	*18.6*	**1.70**	**(1.32, 2.18)**	**<.0001**	1.12	(0.79, 1.60)	0.5204
Humidex	*20.7*	**0.70**	**(0.54, 0.89)**	**0.004**	0.93	(0.66, 1.31)	0.677
Mean Visibility (Km)	*1.6*	**1.02**	**(1.01, 1.02)**	**<.0001**	1.00	(1.00, 1.01)	0.2853
Mean Wind Speed (m/s)	*2.2*	**1.04**	**(1.01, 1.06)**	**0.0018**	0.99	(0.96, 1.02)	0.4074
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.0154	1.00	(1.00, 1.00)	0.5281
Cloud Cover (%)	*5.0*	1.01	(0.99, 1.02)	0.4679	**1.03**	**(1.01, 1.06)**	**0.0022**
Parameter		**Homicide**			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.17	(0.99, 1.39)	0.0651	**0.90**	**(0.85, 0.95)**	**0.0004**
Observances		1.01	(0.81, 1.25)	0.9322	0.98	(0.91, 1.05)	0.5155
Average of Daily 8-Hour Max CO (ppm)	*2.0*	1.25	(0.90, 1.72)	0.1782	0.92	(0.82, 1.02)	0.1224
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.01	(0.96, 1.07)	0.6385	1.01	(0.99, 1.03)	0.3196
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*6.5*	1.02	(0.98, 1.07)	0.3205	1.01	(1.00, 1.03)	0.0792
Average of Daily 1-Hour Max SO_2 (ppb)	*3.6*	1.03	(1.00, 1.06)	0.0665	1.01	(1.00, 1.02)	0.1687
Apparent Temperature (C)	*18.6*	1.85	(0.47, 7.31)	0.3786	**0.26**	**(0.17, 0.39)**	**<.0001**
Humidex	*20.7*	0.75	(0.20, 2.87)	0.6733	**3.79**	**(2.51, 5.73)**	**<.0001**
Mean Visibility (Km)	*1.6*	1.01	(0.99, 1.04)	0.2549	1.01	(1.00, 1.02)	0.0319
Mean Wind Speed (m/s)	*2.2*	1.03	(0.92, 1.17)	0.5909	**0.89**	**(0.86, 0.93)**	**<.0001**
Precipitation (mm)	*1.3*	1.00	(0.99, 1.00)	0.5221	1.00	(1.00, 1.00)	0.5377
Cloud Cover (%)	*5.0*	1.04	(0.96, 1.13)	0.3257	1.01	(0.98, 1.04)	0.4617

Table 28 Continued							
Parameter		**Robbery**			**Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**0.93**	**(0.88, 0.97)**	**0.0018**	**0.87**	**(0.83, 0.90)**	**<.0001**
Observances		1.03	(0.97, 1.09)	0.4085	**0.93**	**(0.88, 0.99)**	**0.0126**
Average of Daily 8-Hour Max CO (ppm)	*2.0*	1.04	(0.96, 1.14)	0.3393	**0.68**	**(0.63, 0.74)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	**0.96**	**(0.95, 0.98)**	**<.0001**	**0.98**	**(0.97, 1.00)**	**0.0093**
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*6.5*	1.00	(0.99, 1.01)	0.8906	1.01	(1.00, 1.03)	0.0079
Average of Daily 1-Hour Max SO_2 (ppb)	*3.6*	1.01	(1.00, 1.02)	0.0158	0.99	(0.99, 1.00)	0.1703
Apparent Temperature (C)	*18.6*	1.12	(0.79, 1.59)	0.5199	**1.58**	**(1.17, 2.14)**	**0.003**
Humidex	*20.7*	0.95	(0.68, 1.34)	0.7697	**0.67**	**(0.50, 0.90)**	**0.008**
Mean Visibility (Km)	*1.6*	1.01	(1.00, 1.01)	0.0056	**1.01**	**(1.01, 1.02)**	**0.0001**
Mean Wind Speed (m/s)	*2.2*	0.98	(0.95, 1.01)	0.1669	1.00	(0.98, 1.03)	0.8296
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.7497	1.00	(1.00, 1.00)	0.3594
Cloud Cover (%)	*5.0*	**1.05**	**(1.02, 1.07)**	**<.0001**	1.01	(1.00, 1.03)	0.1277

Table 29: Crime across Chicago, Houston and Philadelphia Considering Daily Air Pollution Concentrations and Environmental Parameters

Parameter		Assault			Burglary		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.03	(1.00, 1.07)	0.0708	**0.82**	**(0.77, 0.88)**	**<.0001**
Observances		1.04	(0.99, 1.09)	0.1605	1.06	(0.98, 1.15)	0.1639
Average of Daily 8-Hour Max CO (ppm)	*2.0*	**1.27**	**(1.18, 1.37)**	**<.0001**	**1.37**	**(1.21, 1.54)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.01	(1.00 1.03)	0.0591	1.00	(0.98, 1.02)	0.7305
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*6.5*	**1.04**	**(1.03, 1.05)**	**<.0001**	1.01	(0.99, 1.03)	0.218
Average of Daily 1-Hour Max SO_2 (ppb)	*3.6*	1.00	(1.00, 1.01)	0.3534	**1.02**	**(1.01, 1.03)**	**0.0003**
Average of Daily 1-Hour Max NO_2 (ppb)	*17.3*	1.01	(0.99, 1.02)	0.2971	0.99	(0.96, 1.01)	0.213
Average of Daily Mean PM_{10} (ug/m^3)	*16.8*	**0.97**	**(0.96, 0.98)**	**<.0001**	**0.95**	**(0.94, 0.97)**	**<.0001**
Apparent Temperature (C)	*22.1*	**2.49**	**(1.75, 3.54)**	**<.0001**	1.13	(0.68, 1.88)	0.6495
Humidex	*24.4*	**0.50**	**(0.35, 0.71)**	**<.0001**	0.97	(0.59, 1.60)	0.8934
Mean Visibility (Km)	*1.6*	**1.02**	**(1.01, 1.02)**	**<.0001**	1.00	(0.99, 1.01)	0.4537
Mean Wind Speed (m/s)	*2.2*	**1.08**	**(1.05, 1.11)**	**<.0001**	1.01	(0.97, 1.05)	0.5989
Precipitation (mm)	*0.76*	1.00	(1.00, 1.00)	0.1509	1.00	(1.00, 1.00)	0.4474
Cloud Cover (%)	*5.0*	1.00	(0.98, 1.02)	0.8585	1.02	(0.99, 1.05)	0.2076
Parameter		**Homicide**			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**1.34**	**(1.07, 1.68)**	**0.012**	**0.89**	**(0.83, 0.96)**	**0.0016**
Observances		1.16	(0.85, 1.58)	0.3443	0.98	(0.89, 1.08)	0.6855
Average of Daily 8-Hour Max CO (ppm)	*2.0*	0.96	(0.58, 1.60)	0.875	**1.32**	**(1.15, 1.52)**	**0.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.03	(0.95, 1.13)	0.458	1.02	(1.00, 1.05)	0.081
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*6.5*	1.00	(0.93, 1.07)	0.977	**1.02**	**(1.00, 1.05)**	**0.0177**
Average of Daily 1-Hour Max SO_2 (ppb)	*3.6*	1.03	(0.98, 1.08)	0.1876	**1.03**	**(1.02, 1.05)**	**<.0001**
Average of Daily 1-Hour Max NO_2 (ppb)	*17.3*	1.04	(0.95, 1.15)	0.3514	0.98	(0.95, 1.00)	0.0695
Average of Daily Mean PM_{10} (ug/m^3)	*16.8*	1.03	(0.96, 1.10)	0.3769	**0.96**	**(0.94, 0.98)**	**<.0001**
Apparent Temperature (C)	*22.1*	1.72	(0.19, 15.83)	0.6309	**0.14**	**(0.07, 0.25)**	**<.0001**
Humidex	*24.4*	0.82	(0.09, 7.09)	0.8539	**7.14**	**(3.92, 13.03)**	**<.0001**
Mean Visibility (Km)	*1.6*	1.00	(0.97, 1.04)	0.8531	1.00	(1.00, 1.01)	0.3315
Mean Wind Speed (m/s)	*2.2*	1.05	(0.88, 1.24)	0.6123	**0.89**	**(0.85, 0.93)**	**<.0001**
Precipitation (mm)	*0.76*	1.00	(0.00, 0.99)	0.5281	1.00	(1.00, 1.00)	0.3902
Cloud Cover (%)	*5.0*	0.98	(0.87, 1.10)	0.7293	1.00	(0.97, 1.03)	0.9817

Table 29 Continued

Parameter	*IQR*	Robbery Risk Ratio	Robbery Confidence Interval	Robbery P-Value	Theft Risk Ratio	Theft Confidence Interval	Theft P-Value
Federal Holiday		**0.93**	**(0.87, 0.99)**	**0.0167**	**0.87**	**(0.83, 0.90)**	**<.0001**
Observances		**1.09**	**(1.01, 1.18)**	**0.0338**	0.95	(0.88, 0.99)	0.1554
Average of Daily 8-Hour Max CO (ppm)	*2.0*	**1.31**	**(1.16, 1.48)**	**<.0001**	1.03	(0.61, 0.72)	0.4832
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	**0.96**	**(0.94, 0.99)**	**0.0013**	0.99	(0.97, 1.00)	0.2467
Average of Daily Mean $PM_{2.5}$ (ug/m3)	*6.5*	1.01	(0.99, 1.02)	0.5834	1.01	(1.00, 1.02)	0.4123
Average of Daily 1-Hour Max SO_2 (ppb)	*3.6*	1.01	(1.00, 1.02)	0.1809	1.00	(1.00, 1.02)	0.5356
Average of Daily 1-Hour Max NO_2 (ppb)	*17.3*	1.00	(0.98, 1.02)	0.9358	1.00	(0.98, 1.02)	0.8404
Average of Daily Mean PM_{10} (ug/m^3)	*16.8*	**0.97**	**(0.96, 0.99)**	**0.0011**	**0.98**	**(0.96, 0.99)**	**<.0001**
Apparent Temperature (C)	*22.1*	1.23	(0.71, 2.12)	0.4563	1.11	(1.07, 1.95)	0.6165
Humidex	*24.4*	0.90	(0.53, 1.54)	0.6993	1.00	(0.55, 0.99)	0.9915
Mean Visibility (Km)	*1.6*	1.00	(1.00, 1.01)	0.4078	1.00	(1.00, 1.02)	0.2759
Mean Wind Speed (m/s)	*2.2*	1.00	(0.96, 1.04)	0.8793	1.00	(0.97, 1.03)	0.9979
Precipitation (mm)	*0.76*	1.00	(1.00, 1.00)	0.7139	1.00	(1.00, 1.00)	0.1593
Cloud Cover (%)	*5.0*	**1.04**	**(1.01, 1.07)**	**0.0105**	1.00	(1.00, 1.04)	0.6827

Parameter	*IQR*	Rape & Sex Crimes Risk Ratio	Rape & Sex Crimes Confidence Interval	Rape & Sex Crimes P-Value
Federal Holiday		1.61	(1.00, 1.82)	<.0001
Observances		0.90	(1.00, 1.11)	0.3287
Average of Daily 8-Hour Max CO (ppm)	*2.0*	0.94	(0.69, 1.28)	0.7033
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.04	(0.96, 1.07)	0.654
Average of Daily Mean $PM_{2.5}$ (ug/m3)	*6.5*	1.01	(0.97, 1.05)	0.771
Average of Daily 1-Hour Max SO_2 (ppb)	*3.6*	1.00	(0.97, 1.03)	0.8329
Average of Daily 1-Hour Max NO_2 (ppb)	*17.3*	1.00	(0.93, 1.03)	0.4257
Average of Daily Mean PM_{10} (ug/m^3)	*16.8*	1.01	(0.96, 1.05)	0.8239
Apparent Temperature (C)	*22.1*	0.60	(0.16, 2.29)	0.4501
Humidex	*24.4*	1.98	(0.53, 7.40)	0.3114
Mean Visibility (Km)	*1.6*	**1.04**	**(1.02, 1.06)**	**0.0005**
Mean Wind Speed (m/s)	*2.2*	0.94	(0.84, 1.04)	0.2216
Precipitation (mm)	*0.76*	1.00	(1.00, 1.00)	0.9517
Cloud Cover (%)	*5.0*	**1.02**	**(1.03, 1.18)**	**0.0051**

Tables 30 to 33 show the results of the individual models for each study location. In Chicago (Table 30), increases in apparent temperature from the 25th percentile to the 75th percentile resulted in increases in assault (RR: 3.39), burglary (RR: 1.99), robbery (RR: 2.33), theft (RR: 1.50) and damage (RR: 9.59). Similar increases in CO concentrations also resulted in increased numbers of assault (RR: 1.45), burglary (RR: 2.00), motor vehicle theft (RR: 1.69), robbery (RR: 1.64), damage (RR: 1.97) and trespassing (RR: 1.64). Increased concentrations of SO_2-- comparing the 75th percentile of the IQR to 25th percentile-- were associated with increases in burglaries (RR: 1.03), motor vehicle thefts (RR: 1.05), robberies (RR: 1.02) and interfering with an officer (RR: 1.06). Rape and sex crimes increased by 1.09 or 9% when at the 75th percentile of visibility (CI: (1.03, 1.14) and 75th percentile of percent of cloud cover (CI: 1.02, 1.17) compared to the 25th percentile values. Increases in wind speed were associated in increased assault (RR: 1.10), burglary (RR: 1.06) and damage (RR: 1.19).

Several environmental factors were also associated with decreases in crimes. For example, assault crimes decreased when humidex (RR: 0.38) and PM_{10} (RR: 0.96) increased and burglary crimes decreased on federal holidays (RR: 0.83), PM_{10} (RR: 0.94) and humidex (RR: 0.56). Decreases in crime were found when PM_{10} increased for burglary (RR: 0.94), motor vehicle theft (RR: 0.97) and damage (RR: 0.93).

The Houston model (Table 31) had much less significance then the previously discussed models. Burglary and theft crimes decreased on federal holidays by 0.77 (CI: 0.62, 0.98) or 23% and 0.76 (CI: 0.62, 0.94) or 24%, respectively. Rape and sex crimes decreased when CO and PM_{10} increased from the 25th percentile to 75th percentile by 0.12

(CI: 0.02, 0.87) or 88% and 0.87 (CI: 0.76, 0.99) or 13%, respectively. Motor vehicle thefts also decreased by 0.94 (CI: 0.90, 0.98) or 6% when SO_2 concentrations increased from the 25th percentile to the 75th percentile. When looking at homicides, both apparent temperature and humidex were associated with increased numbers of crime from the 25th percentile to the 75th percentile of measurements.

Table 32 presents results for the Philadelphia model. Like the Chicago model, increases in apparent temperature from the 25th percentile to the 75th resulted in increases in assault (RR: 9.16), burglary (RR: 3.65), robbery (RR: 5.84) and theft (RR: 2.88). Motor vehicle theft crimes increased when O_3 (RR: 1.16), SO_2 (RR: 1.08), NO_2 (RR: 1.22) and visibility (RR: 1.08) increased from the 25th percentile to the 75th percentile. Increases in PM_{10} concentrations were associated with decreases in burglary (RR: 0.96), motor vehicle theft (RR: 0.86), robbery (RR: 0.96) and theft (RR: 0.96); however, rape and sex crimes were found to increase by 1.18 (CI: 1.09, 1.27) or 18%.

Table 33 presents results of the Seattle model. It is noteworthy how when $PM_{2.5}$ concentrations increased from the 25th percentile to the 75th percentile, there were strong associations with crime as observed for assault (RR: 1.31), burglary (RR: 1.29), motor vehicle theft (RR; 1.20), robbery (RR: 1.26), theft (RR: 1.33), trespass (RR: 1.33), arson and reckless burning (RR: 1.45), damage (RR: 1.29), disorderly conduct (RR: 1.95), harassment (RR: 1.23). The other significant air pollution related observations resulted in a decrease in crime incidents. Increases in CO concentrations had an association with decreases in burglary (RR: 0.53), motor vehicle theft (RR: 0.70), robbery (RR: 0.60), theft (RR: 0.51), trespass (RR: 0.49), damage (RR: 0.50) and harassment (RR: 0.47).

Likewise, increases in O_3 concentrations had an association with decreases in burglary (RR: 0.88), motor vehicle theft (RR: 0.91), robbery (RR: 0.89), theft (RR: 0.92), trespass (RR: 0.14), damage (RR: 0.90) and harassment (RR: 0.86).In addition, SO_2 increases resulted in decreases in burglary (RR: 0.95), motor vehicle theft (RR: 0.94), theft (RR: 0.96), damage (RR: 0.96) and harassment (RR: 0.95).

Table 30: Crime in Chicago Considering Daily Air Pollution Concentrations and Environmental Parameters

		Assault			**Burglary**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.03	(0.99, 1.07)	0.1774	**0.83**	**(0.79, 0.89)**	**<.0001**
Observances		1.03	(0.97, 1.09)	0.3125	**1.10**	**(1.01, 1.19)**	**0.0234**
Average of Daily 8-Hour Max CO (ppm)	*3.0*	**1.45**	**(1.28, 1.64)**	**<.0001**	**2.00**	**(1.69, 2.37)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.02	(1.00 1.04)	0.0918	1.00	(0.97, 1.02)	0.884
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*7.2*	**1.04**	**(1.03, 1.06)**	**<.0001**	1.01	(0.99, 1.03)	0.2024
Average of Daily 1-Hour Max SO_2 (ppb)	*4.0*	1.00	(1.00, 1.01)	0.324	**1.03**	**(1.02, 1.04)**	**<.0001**
Average of Daily 1-Hour Max NO_2 (ppb)	*15.6*	1.01	(0.99, 1.02)	0.3169	**0.98**	**(0.96, 1.00)**	**0.0357**
Average of Daily Mean PM_{10} (ug/m^3)	*16.5*	**0.96**	**(0.95, 0.98)**	**<.0001**	**0.94**	**(0.93, 0.96)**	**<.0001**
Apparent Temperature (C)	*22.6*	**3.39**	**(2.23, 5.13)**	**<.0001**	**1.99**	**(1.12, 3.53)**	**0.0195**
Humidex	*24.1*	**0.38**	**(0.26, 0.57)**	**<.0001**	**0.56**	**(0.33, 0.98)**	**0.0421**
Mean Visibility (Km)	*3.2*	**1.03**	**(1.02, 1.04)**	**<.0001**	0.99	(0.97, 1.00)	0.1286
Mean Wind Speed (m/s)	*2.2*	**1.10**	**(1.07, 1.14)**	**<.0001**	**1.06**	**(1.01, 1.11)**	**0.0108**
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.4664	1.00	(1.00, 1.00)	0.6645
Cloud Cover (%)	*4.0*	1.00	(0.99, 1.02)	0.8728	1.02	(1.00, 1.04)	0.0691
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.31	(1.00, 1.72)	0.0483	**0.91**	**(0.85, 0.97)**	**0.0076**
Observances		1.27	(0.89, 1.80)	0.1826	0.96	(0.87, 1.06)	0.4362
Average of Daily 8-Hour Max CO (ppm)	*3.0*	1.03	(0.41, 2.57)	0.9577	**1.69**	**(1.37, 2.09)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.03	(0.90, 1.17)	0.6839	1.03	(1.00, 1.06)	0.0891
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*7.2*	0.99	(0.91, 1.09)	0.9053	1.02	(1.00, 1.04)	0.0508
Average of Daily 1-Hour Max SO_2 (ppb)	*4.0*	1.03	(0.97, 1.10)	0.3638	**1.05**	**(1.03, 1.07)**	**<.0001**
Average of Daily 1-Hour Max NO_2 (ppb)	*15.6*	0.98	(0.89, 1.08)	0.6878	**0.96**	**(0.94, 0.99)**	**0.0016**
Average of Daily Mean PM_{10} (ug/m^3)	*16.5*	1.07	(0.99, 1.17)	0.1009	**0.97**	**(0.95, 0.99)**	**0.0014**
Apparent Temperature (C)	*22.6*	1.25	(0.06, 25.04)	0.882	**0.28**	**(0.14, 0.57)**	**0.0004**
Humidex	*24.1*	1.16	(0.07, 19.97)	0.9191	**3.35**	**(1.69, 6.67)**	**0.0005**
Mean Visibility (Km)	*3.2*	1.03	(0.95, 1.13)	0.4562	1.00	(0.98, 1.02)	0.8202
Mean Wind Speed (m/s)	*2.2*	0.98	(0.78, 1.24)	0.8983	**0.94**	**(0.89, 0.99)**	**0.0228**
Precipitation (mm)	*1.3*	1.00	(0.99, 1.01)	0.9307	1.00	(1.00, 1.00)	0.2226
Cloud Cover (%)	*4.0*	1.01	(0.90, 1.13)	0.9105	1.00	(0.98, 1.03)	0.7981

Table 30 Continued							
		Robbery			**Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**0.93**	**(0.87, 0.99)**	**0.0296**	**0.91**	**(0.87, 0.94)**	**<.0001**
Observances		1.05	(0.96, 1.15)	0.2585	**0.93**	**(0.88, 0.99)**	**0.0189**
Average of Daily 8-Hour Max CO (ppm)	*3.0*	**1.64**	**(1.34, 1.99)**	**<.0001**	1.08	(0.96, 1.22)	0.1972
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	**0.96**	**(0.93, 0.99)**	**0.0101**	0.98	(0.97, 1.00)	0.056
Average of Daily Mean $PM_{2.5}$ (ug/m3)	*7.2*	1.00	(0.98, 1.02)	0.9609	1.01	(1.00, 1.02)	0.3765
Average of Daily 1-Hour Max SO_2 (ppb)	*4.0*	1.02	(1.00, 1.03)	0.0259	1.01	(1.00, 1.02)	0.0579
Average of Daily 1-Hour Max NO_2 (ppb)	*15.6*	1.01	(0.98, 1.03)	0.5219	0.99	(0.98, 1.01)	0.3694
Average of Daily Mean PM_{10} (ug/m^3)	*16.5*	0.98	(0.96, 1.00)	0.027	**0.98**	**(0.97, 1.00)**	**0.0035**
Apparent Temperature (C)	*22.6*	**2.33**	**(1.18, 4.56)**	**0.0141**	**1.50**	**(1.01, 2.23)**	**0.0448**
Humidex	*24.1*	**0.50**	**(0.26, 0.95)**	**0.0337**	0.75	(0.52, 1.10)	0.1412
Mean Visibility (Km)	*3.2*	1.00	(0.98, 1.01)	0.6921	1.01	(1.00, 1.03)	0.0119
Mean Wind Speed (m/s)	*2.2*	1.05	(1.00, 1.11)	0.0505	1.02	(0.99, 1.05)	0.1939
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.7215	1.00	(1.00, 1.00)	0.0878
Cloud Cover (%)	*4.0*	1.03	(1.00, 1.05)	0.0448	1.00	(0.99, 1.02)	0.5991
		Arson & Burning			**Damage**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		0.89	(0.67, 1.19)	0.4424	1.04	(0.98, 1.10)	0.2074
Observances		0.65	(0.41, 1.01)	0.0576	1.07	(0.99, 1.15)	0.0787
Average of Daily 8-Hour Max CO (ppm)	*3.0*	1.61	(0.69, 3.74)	0.2663	**1.97**	**(1.65, 2.34)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.09	(0.97, 1.24)	0.1557	0.99	(0.97, 1.02)	0.6304
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*7.2*	1.08	(0.99, 1.18)	0.066	**1.04**	**(1.02, 1.06)**	**<.0001**
Average of Daily 1-Hour Max SO_2 (ppb)	*4.0*	1.03	(0.97, 1.10)	0.2728	1.00	(0.98, 1.01)	0.5628
Average of Daily 1-Hour Max NO_2 (ppb)	*15.6*	0.98	(0.89, 1.07)	0.6273	1.00	(0.98, 1.02)	0.7182
Average of Daily Mean PM_{10} (ug/m^3)	*16.5*	**0.90**	**(0.83, 0.98)**	**0.0196**	**0.93**	**(0.92, 0.95)**	**<.0001**
Apparent Temperature (C)	*22.6*	14.56	(0.88, 241.28)	0.0612	**9.59**	**(5.30, 17.37)**	**<.0001**
Humidex	*24.1*	0.08	(0.01, 1.18)	0.0664	**0.13**	**(0.08, 0.24)**	**<.0001**
Mean Visibility (Km)	*3.2*	1.07	(0.98, 1.15)	0.1138	**1.03**	**(1.02, 1.05)**	**<.0001**
Mean Wind Speed (m/s)	*2.2*	1.17	(0.94, 1.46)	0.157	**1.19**	**(1.14, 1.25)**	**<.0001**
Precipitation (mm)	*1.3*	1.00	(0.99, 1.01)	0.6986	1.00	(1.00, 1.00)	0.2725
Cloud Cover (%)	*4.0*	1.02	(0.91, 1.13)	0.7716	1.02	(1.00, 1.04)	0.07

Table 30 Continued

		Interference with Public Officer			Rape & Sex Crimes		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		0.93	(0.75, 1.15)	0.5234	**1.72**	**(1.48, 4.41)**	**<.0001**
Observances		0.90	(0.66, 1.23)	0.5077	0.91	(0.71, 2.03)	0.4738
Average of Daily 8-Hour Max CO (ppm)	*3.0*	**0.36**	**(0.18, 0.72)**	**0.0038**	1.10	(0.62, 1.94)	0.7399
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.00	(0.91, 1.10)	0.9921	1.01	(0.93, 1.10)	0.7908
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*7.2*	0.99	(0.93, 1.06)	0.8319	1.00	(0.95, 1.06)	0.9826
Average of Daily 1-Hour Max SO_2 (ppb)	*4.0*	**1.06**	**(1.01, 1.11)**	**0.0115**	1.00	(0.97, 1.05)	0.8218
Average of Daily 1-Hour Max NO_2 (ppb)	*15.6*	0.94	(0.87, 1.01)	0.0875	0.97	(0.91, 1.03)	0.3594
Average of Daily Mean PM_{10} (ug/m^3)	*16.5*	**1.07**	**(1.01, 1.14)**	**0.0232**	1.00	(0.94, 1.05)	0.851
Apparent Temperature (C)	*22.6*	2.13	(0.25, 18.21)	0.4918	0.55	(0.09, 3.47)	0.5278
Humidex	*24.1*	0.68	(0.09, 5.24)	0.7071	2.18	(0.38, 12.57)	0.3836
Mean Visibility (Km)	*3.2*	0.99	(0.93, 1.06)	0.8568	**1.09**	**(1.03, 1.14)**	**0.0018**
Mean Wind Speed (m/s)	*2.2*	1.00	(0.85, 1.18)	0.9987	0.94	(0.82, 1.09)	0.4341
Precipitation (mm)	*1.3*	0.99	(0.98, 1.00)	0.0588	1.00	(0.99, 1.00)	0.235
Cloud Cover (%)	*4.0*	**0.91**	**(0.84, 0.98)**	**0.0169**	**1.09**	**(1.02, 1.17)**	**0.0115**

		Trespass		
	IQR	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**0.77**	**(0.71, 0.83)**	**<.0001**
Observances		**0.78**	**(0.70, 0.88)**	**<.0001**
Average of Daily 8-Hour Max CO (ppm)	*3.0*	**1.64**	**(1.30, 2.06)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	0.99	(0.96, 1.03)	0.8499
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*7.2*	1.02	(0.99, 1.04)	0.1659
Average of Daily 1-Hour Max SO_2 (ppb)	*4.0*	1.00	(0.98, 1.01)	0.8139
Average of Daily 1-Hour Max NO_2 (ppb)	*15.6*	**1.04**	**(1.02, 1.07)**	**0.001**
Average of Daily Mean PM_{10} (ug/m^3)	*16.5*	**0.95**	**(0.93, 0.97)**	**<.0001**
Apparent Temperature (C)	*22.6*	1.26	(0.59, 2.73)	0.5501
Humidex	*24.1*	0.85	(0.41, 1.79)	0.6753
Mean Visibility (Km)	*3.2*	1.02	(1.00, 1.04)	0.0541
Mean Wind Speed (m/s)	*2.2*	1.06	(1.00, 1.12)	0.0666
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.5881
Cloud Cover (%)	*4.0*	1.00	(0.99, 1.05)	0.2404

Table 31: Crime in Houston Considering Daily Air Pollution Concentrations and Environmental Parameters

		Assault			**Burglary**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		0.96	(0.76, 1.21)	0.7219	**0.77**	**(0.62, 0.98)**	**0.0306**
Observances		1.12	(0.89, 1.42)	0.3214	1.11	(0.87, 1.42)	0.4096
Average of Daily 8-Hour Max CO (ppm)	*3.0*	0.88	(0.39, 2.02)	0.7703	0.65	(0.31, 1.38)	0.2659
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.01	(0.95 1.08)	0.7099	0.98	(0.92, 1.04)	0.4431
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*5.2*	1.03	(0.97, 1.09)	0.3185	1.02	(0.96, 1.07)	0.5613
Average of Daily 1-Hour Max SO_2 (ppb)	*3.8*	1.01	(0.96, 1.05)	0.7764	1.00	(0.96, 1.04)	0.953
Average of Daily 1-Hour Max NO_2 (ppb)	*18.4*	1.01	(0.91, 1.13)	0.8308	1.07	(0.97, 1.18)	0.1838
Average of Daily Mean PM_{10} (ug/m^3)	*17.0*	0.98	(0.93, 1.04)	0.5172	0.97	(0.93, 1.02)	0.2213
Apparent Temperature (C)	*18.4*	2.11	(0.21, 21.66)	0.5296	1.13	(0.13, 9.86)	0.9147
Humidex	*21.1*	0.59	(0.06, 5.84)	0.6506	0.99	(0.12, 8.38)	0.9905
Mean Visibility (Km)	*1.6*	0.99	(0.96, 1.03)	0.6341	0.99	(0.96, 1.02)	0.5493
Mean Wind Speed (m/s)	*2.2*	1.05	(0.88, 1.27)	0.5691	1.01	(0.85, 1.20)	0.9115
Precipitation (mm)	*0.25*	1.00	(1.00, 1.00)	0.2974	1.00	(1.00, 1.00)	0.7223
Cloud Cover (%)	*4.0*	1.01	(0.93, 1.10)	0.7743	1.00	(0.92, 1.08)	0.9264
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.16	(0.53, 2.58)	0.7067	0.80	(0.64, 1.01)	0.0653
Observances		0.29	(0.06, 1.37)	0.1193	1.00	(0.78, 1.28)	0.9921
Average of Daily 8-Hour Max CO (ppm)	*3.0*	0.69	(0.03, 16.71)	0.821	1.04	(0.48, 2.24)	0.9226
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.17	(0.91, 1.49)	0.2188	0.99	(0.93, 1.06)	0.7935
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*5.2*	1.08	(0.87, 1.34)	0.4786	1.01	(0.96, 1.07)	0.6613
Average of Daily 1-Hour Max SO_2 (ppb)	*3.8*	1.04	(0.88, 1.23)	0.6311	**0.94**	**(0.90, 0.98)**	**0.0071**
Average of Daily 1-Hour Max NO_2 (ppb)	*18.4*	1.17	(0.78, 1.76)	0.4562	1.01	(0.91, 1.11)	0.8902
Average of Daily Mean PM_{10} (ug/m^3)	*17.0*	0.92	(0.75, 1.14)	0.4582	0.98	(0.94, 1.03)	0.5503
Apparent Temperature (C)	*18.4*	**0.00008**	**(0.00, 0.57)**	**0.037**	0.75	(0.08, 6.97)	0.8036
Humidex	*21.1*	**13055**	**(0.07, 80627319)**	**0.0333**	1.37	(0.15, 12.25)	0.7807
Mean Visibility (Km)	*1.6*	0.94	(0.84, 1.07)	0.3575	0.99	(0.96, 1.02)	0.6764
Mean Wind Speed (m/s)	*2.2*	0.57	(0.28, 1.15)	0.1149	0.95	(0.80, 1.14)	0.6061
Precipitation (mm)	*0.25*	1.00	(0.99, 1.00)	0.3573	1.00	(1.00, 1.00)	0.8197
Cloud Cover (%)	*4.0*	0.84	(0.61, 1.16)	0.282	1.03	(0.95, 1.12)	0.4926

Table 31 Continued

		Robbery			Theft		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		0.79	(0.61, 1.02)	0.0689	**0.76**	**(0.62, 0.94)**	**0.0118**
Observances		1.21	(0.95, 1.54)	0.1217	1.01	(0.81, 1.26)	0.918
Average of Daily 8-Hour Max CO (ppm)	*3.0*	1.19	(0.52, 2.74)	0.686	0.76	(0.39, 1.51)	0.4418
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.00	(0.93, 1.07)	0.9271	1.00	(0.94, 1.05)	0.8708
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*5.2*	1.03	(0.97, 1.10)	0.2929	1.01	(0.96, 1.06)	0.672
Average of Daily 1-Hour Max SO_2 (ppb)	*3.8*	0.96	(0.91, 1.01)	0.0821	0.97	(0.93, 1.01)	0.1113
Average of Daily 1-Hour Max NO_2 (ppb)	*18.4*	0.95	(0.85, 1.06)	0.3717	1.02	(0.93, 1.11)	0.7141
Average of Daily Mean PM_{10} (ug/m^3)	*17.0*	0.96	(0.90, 1.01)	0.114	0.98	(0.94, 1.03)	0.4443
Apparent Temperature (C)	*18.4*	0.25	(0.02, 2.97)	0.2753	0.49	(0.07, 3.53)	0.4799
Humidex	*21.1*	3.94	(0.35, 44.42)	0.2676	2.07	(0.30, 14.53)	0.4631
Mean Visibility (Km)	*1.6*	0.99	(0.96, 1.02)	0.5963	0.99	(0.97, 1.02)	0.5941
Mean Wind Speed (m/s)	*2.2*	0.86	(0.71, 1.05)	0.1413	0.93	(0.80, 1.09)	0.3552
Precipitation (mm)	*0.25*	1.00	(1.00, 1.00)	0.7631	1.00	(1.00, 1.00)	0.6522
Cloud Cover (%)	*4.0*	1.02	(0.93, 1.12)	0.6279	0.99	(0.92, 1.07)	0.8406

		Rape & Sex Crimes		
	IQR	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.05	(0.64, 1.90)	0.8371
Observances		0.70	(0.35, 1.42)	0.3022
Average of Daily 8-Hour Max CO (ppm)	*3.0*	**0.12**	**(0.02, 0.87)**	**0.0356**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	0.94	(0.81, 1.09)	0.405
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*5.2*	1.13	(0.99, 1.28)	0.0603
Average of Daily 1-Hour Max SO_2 (ppb)	*3.8*	1.06	(0.96, 1.17)	0.2879
Average of Daily 1-Hour Max NO_2 (ppb)	*18.4*	1.06	(0.83, 1.36)	0.6314
Average of Daily Mean PM_{10} (ug/m^3)	*17.0*	**0.87**	**(0.76, 0.99)**	**0.0297**
Apparent Temperature (C)	*18.4*	1.85	(0.01, 341.04)	0.8174
Humidex	*21.1*	0.72	(0.00, 121.72)	0.8997
Mean Visibility (Km)	*1.6*	1.00	(0.94, 1.08)	0.8999
Mean Wind Speed (m/s)	*2.2*	0.95	(0.63, 1.44)	0.8269
Precipitation (mm)	*0.25*	1.00	(1.00, 1.00)	0.0128
Cloud Cover (%)	*4.0*	0.99	(0.82, 1.20)	0.9196

Table 32: Crime in Philadelphia Considering Daily Air Pollution Concentrations and Environmental Parameters

		Assault			Burglary		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**1.22**	**(1.08, 1.38)**	**0.0015**	0.88	(0.76, 1.01)	0.0692
Observances		1.11	(0.91, 1.35)	0.312	**0.75**	**(0.59, 0.96)**	**0.023**
Average of Daily 8-Hour Max CO (ppm)	*0.10*	1.00	(0.99, 1.02)	0.5226	0.99	(0.98, 1.01)	0.4661
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	1.04	(0.99 1.09)	0.1458	0.99	(0.94, 1.04)	0.5767
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*6.9*	1.00	(0.96, 1.04)	0.9679	1.03	(0.99, 1.08)	0.1483
Average of Daily 1-Hour Max SO_2 (ppb)	*3.4*	1.02	(0.99, 1.04)	0.2104	1.02	(0.99, 1.04)	0.216
Average of Daily 1-Hour Max NO_2 (ppb)	*15.1*	1.00	(0.96, 1.05)	0.9281	1.02	(0.97, 1.07)	0.465
Average of Daily Mean PM_{10} (ug/m^3)	*14.0*	0.97	(0.94, 1.00)	0.072	**0.96**	**(0.93, 0.99)**	**0.0205**
Apparent Temperature (C)	*21.5*	**9.16**	**(2.77, 30.29)**	**0.0003**	**3.65**	**(1.03, 12.92)**	**0.0449**
Humidex	*23.3*	**0.15**	**(0.05, 0.45)**	**0.0009**	0.32	(0.10, 1.08)	0.0658
Mean Visibility (Km)	*3.2*	1.02	(0.99, 1.06)	0.1859	1.02	(0.99, 1.06)	0.2051
Mean Wind Speed (m/s)	*2.2*	**1.15**	**(1.05, 1.26)**	**0.0039**	1.09	(0.99, 1.20)	0.0818
Precipitation (mm)	*1.02*	1.00	(1.00, 1.00)	0.4186	1.00	(1.00, 1.00)	0.567
Cloud Cover (%)	*5.0*	1.06	(1.00, 1.12)	0.0555	1.04	(0.98, 1.10)	0.2214
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.33	(0.80, 2.22)	0.2727	0.79	(0.57, 1.07)	0.129
Observances		1.46	(0.69, 3.11)	0.3272	0.98	(0.62, 1.55)	0.9327
Average of Daily 8-Hour Max CO (ppm)	*0.10*	0.98	(0.92, 1.04)	0.4564	**0.96**	**(0.93, 0.99)**	**0.0141**
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	0.97	(0.79, 1.20)	0.8033	**1.16**	**(1.04, 1.29)**	**0.006**
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*6.9*	0.92	(0.77, 1.11)	0.3982	1.08	(0.98, 1.18)	0.1368
Average of Daily 1-Hour Max SO_2 (ppb)	*3.4*	1.04	(0.94, 1.15)	0.4685	**1.08**	**(1.02, 1.13)**	**0.0054**
Average of Daily 1-Hour Max NO_2 (ppb)	*15.1*	1.20	(0.99, 1.45)	0.0718	**1.22**	**(1.11, 1.35)**	**<.0001**
Average of Daily Mean PM_{10} (ug/m^3)	*14.0*	1.04	(0.91, 1.18)	0.5943	**0.86**	**(0.80, 0.92)**	**<.0001**
Apparent Temperature (C)	*21.5*	5.13	(0.03, 909)	0.536	0.67	(0.04, 10.27)	0.7724
Humidex	*23.3*	0.29	(0.00, 39.33)	0.6192	1.92	(0.14, 25.91)	0.6235
Mean Visibility (Km)	*3.2*	0.95	(0.83, 1.10)	0.4904	1.08	(1.00, 1.16)	0.0432
Mean Wind Speed (m/s)	*2.2*	1.12	(0.74, 1.68)	0.5909	1.05	(0.85, 1.30)	0.6558
Precipitation (mm)	*1.02*	0.99	(0.97, 1.00)	0.103	1.00	(0.99, 1.01)	0.8824
Cloud Cover (%)	*5.0*	0.93	(0.72, 1.19)	0.5548	1.05	(0.92, 1.19)	0.4643

Table 32 Continued

		Robbery			Theft		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.02	(0.90, 1.15)	0.7808	**0.81**	**(0.75, 0.87)**	**<.0001**
Observances		1.10	(0.91, 1.34)	0.3212	0.90	(0.80, 1.02)	0.101
Average of Daily 8-Hour Max CO (ppm)	*0.10*	1.00	(0.99, 1.02)	0.7521	1.00	(0.99, 1.01)	0.7623
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	0.96	(0.91, 1.00)	0.0651	0.99	(0.96, 1.01)	0.34
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*6.9*	1.01	(0.97, 1.06)	0.5314	1.00	(0.98, 1.03)	0.8003
Average of Daily 1-Hour Max SO_2 (ppb)	*3.4*	**1.03**	**(1.01, 1.06)**	**0.0115**	1.01	(1.00, 1.03)	0.0814
Average of Daily 1-Hour Max NO_2 (ppb)	*15.1*	0.97	(0.93, 1.01)	0.1654	1.00	(0.97, 1.02)	0.8525
Average of Daily Mean PM_{10} (ug/m^3)	*14.0*	**0.96**	**(0.93, 0.99)**	**0.0098**	**0.96**	**(0.95, 0.98)**	**<.0001**
Apparent Temperature (C)	*21.5*	**5.84**	**(1.84, 18.61)**	**0.0028**	**2.88**	**(1.47, 5.63)**	**0.0019**
Humidex	*23.3*	**0.20**	**(0.07, 0.59)**	**0.0037**	**0.43**	**(0.23, 0.82)**	**0.0099**
Mean Visibility (Km)	*3.2*	1.03	(1.00, 1.06)	0.0483	1.00	(0.98, 1.02)	0.8262
Mean Wind Speed (m/s)	*2.2*	1.07	(0.98, 1.18)	0.1218	**1.07**	**(1.01, 1.12)**	**0.0154**
Precipitation (mm)	*1.02*	1.00	(1.00, 1.01)	0.0054	1.00	(1.00, 1.00)	0.1821
Cloud Cover (%)	*5.0*	1.06	(1.00, 1.12)	0.0462	0.98	(0.95, 1.01)	0.2104

		Rape & Sex Crimes		
	IQR	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.10	(0.81, 2.24)	0.5586
Observances		0.87	(0.50, 1.65)	0.6366
Average of Daily 8-Hour Max CO (ppm)	*0.10*	0.98	(0.95, 1.02)	0.3838
Average of Daily 8-Hour Max O_3 (ppm)	*0.02*	0.99	(0.87, 1.11)	0.8357
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*6.9*	0.96	(0.87, 1.07)	0.4949
Average of Daily 1-Hour Max SO_2 (ppb)	*3.4*	**0.89**	**(0.82, 0.96)**	**0.0029**
Average of Daily 1-Hour Max NO_2 (ppb)	*15.1*	1.07	(0.95, 1.20)	0.266
Average of Daily Mean PM_{10} (ug/m^3)	*14.0*	**1.18**	**(1.09, 1.27)**	**<.0001**
Apparent Temperature (C)	*21.5*	0.92	(0.04, 18.89)	0.9557
Humidex	*23.3*	1.21	(0.07, 21.45)	0.8962
Mean Visibility (Km)	*3.2*	1.05	(0.96, 1.14)	0.2794
Mean Wind Speed (m/s)	*2.2*	0.96	(0.76, 1.22)	0.7677
Precipitation (mm)	*1.02*	1.00	(0.99, 1.01)	0.7697
Cloud Cover (%)	*5.0*	1.05	(0.91, 1.21)	0.5028

Table 33: Crime in Seattle Considering Daily Air Pollution Concentrations and Environmental Parameters

		Assault			**Burglary**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.06	(0.85, 1.32)	0.6242	0.90	(0.73, 1.04)	0.2823
Observances		1.14	(0.86, 1.50)	0.3565	1.05	(0.80, 1.38)	0.7221
Average of Daily 8-Hour Max CO (ppm)	*0.20*	**0.48**	**(0.44, 0.51)**	**<.0001**	**0.53**	**(0.50, 0.57)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.01*	0.94	(0.86 1.02)	0.1295	**0.88**	**(0.82, 0.94)**	**0.0004**
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*4.2*	**1.31**	**(1.23, 1.40)**	**<.0001**	**1.29**	**(1.21, 1.36)**	**<.0001**
Average of Daily 1-Hour Max SO_2 (ppb)	*3.5*	0.99	(0.95, 1.02)	0.4602	**0.95**	**(0.92, 0.98)**	**0.0028**
Apparent Temperature (C)	*11.5*	0.31	(0.02, 3.84)	0.3603	0.66	(0.07, 6.59)	0.7198
Humidex	*12.3*	2.79	(0.25, 31.26)	0.4044	1.28	(0.14, 11.70)	0.8252
Mean Visibility (Km)	*1.6*	1.03	(0.98, 1.08)	0.2106	1.00	(0.96, 1.06)	0.9168
Mean Wind Speed (m/s)	*1.8*	0.80	(0.59, 1.07)	0.1252	0.90	(0.69, 1.17)	0.4378
Precipitation (mm)	*2.3*	1.00	(0.98, 1.02)	0.7792	1.00	(0.99, 1.02)	0.6006
Cloud Cover (%)	*4.0*	0.98	(0.90, 1.07)	0.6804	1.00	(0.92, 1.08)	0.9878
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.26	(0.25, 4.71)	0.7576	0.88	(0.70, 1.11)	0.2873
Observances		0.00	(0.00, 0.00)	0.9997	1.08	(0.80, 1.44)	0.6238
Average of Daily 8-Hour Max CO (ppm)	*0.20*	0.76	(0.50, 1.15)	0.1916	**0.70**	**(0.66, 0.74)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.01*	0.98	(0.52, 1.84)	0.9441	**0.91**	**(0.84, 0.99)**	**0.0228**
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*4.2*	1.13	(0.71, 1.80)	0.6084	**1.20**	**(1.13, 1.28)**	**<.0001**
Average of Daily 1-Hour Max SO_2 (ppb)	*3.5*	0.95	(0.72, 1.24)	0.6842	**0.94**	**(0.91, 0.98)**	**0.0021**
Apparent Temperature (C)	*11.5*	975957.58	(0.04, 352933950044857)	0.1554	1.00	(0.08, 13.09)	0.9997
Humidex	*12.3*	0.00	(0.00, 210.45)	0.1662	0.93	(0.08, 10.90)	0.9534
Mean Visibility (Km)	*1.6*	0.83	(0.62, 1.11)	0.219	1.01	(0.96, 1.05)	0.7627
Mean Wind Speed (m/s)	*1.8*	3.62	(0.40, 32.90)	0.2534	0.94	(0.70, 1.27)	0.6968
Precipitation (mm)	*2.3*	0.94	(0.77, 1.14)	0.5052	1.00	(0.98, 1.02)	0.7213
Cloud Cover (%)	*4.0*	1.76	(0.86, 3.61)	0.1212	1.06	(0.96, 1.15)	0.2396

Table 33 Continued							
		Robbery			**Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		0.99	(0.76, 1.24)	0.9512	0.92	(0.77, 1.10)	0.3795
Observances		1.15	(0.87, 1.53)	0.3224	1.03	(0.81, 1.30)	0.8318
Average of Daily 8-Hour Max CO (ppm)	*0.20*	**0.60**	**(0.57, 0.64)**	**<.0001**	**0.51**	**(0.48, 0.54)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.01*	**0.89**	**(0.82, 0.96)**	**0.0044**	**0.92**	**(0.86, 0.98)**	**0.0088**
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*4.2*	**1.26**	**(1.19, 1.35)**	**<.0001**	**1.33**	**(1.26, 1.39)**	**<.0001**
Average of Daily 1-Hour Max SO_2 (ppb)	*3.5*	0.99	(0.96, 1.02)	0.5109	**0.96**	**(0.93, 0.99)**	**0.0032**
Apparent Temperature (C)	*11.5*	1.31	(0.10, 16.60)	0.8346	0.34	(0.05, 2.48)	0.2873
Humidex	*12.3*	0.69	(0.06, 7.81)	0.7626	2.44	(0.36, 16.40)	0.3578
Mean Visibility (Km)	*1.6*	1.04	(0.99, 1.09)	0.1198	1.02	(0.98, 1.06)	0.3456
Mean Wind Speed (m/s)	*1.8*	0.98	(0.73, 1.32)	0.9165	**0.79**	**(0.63, 0.99)**	**0.0438**
Precipitation (mm)	*2.3*	1.00	(0.98, 1.02)	0.8816	0.99	(0.97, 1.01)	0.2159
Cloud Cover (%)	*4.0*	1.03	(0.95, 1.13)	0.4534	1.03	(0.96, 1.10)	0.3915
		Trespass			**Arson & Burning**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.10	(0.83, 1.45)	0.5082	1.88	(0.69, 5.08)	0.2146
Observances		1.20	(0.83, 1.75)	0.3374	0.73	(0.11, 4.78)	0.7454
Average of Daily 8-Hour Max CO (ppm)	*0.20*	**0.49**	**(0.44, 0.54)**	**<.0001**	**0.27**	**(0.15, 0.48)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.01*	**0.14**	**(0.74, 0.91)**	**0.0002**	0.81	(0.52, 1.28)	0.3774
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*4.2*	**1.33**	**(1.23, 1.45)**	**<.0001**	**1.45**	**(1.04, 2.04)**	**0.0299**
Average of Daily 1-Hour Max SO_2 (ppb)	*3.5*	1.00	(0.92, 1.01)	0.145	0.95	(0.79, 1.15)	0.6282
Apparent Temperature (C)	*11.5*	25.79	(0.97, 682.15)	0.0518	0.01	(0.00, 4705.68)	0.4749
Humidex	*12.3*	**0.04**	**(0.00, 0.95)**	**0.0464**	75.75	(0.00, 25897193.97)	0.5057
Mean Visibility (Km)	*1.6*	1.03	(0.96, 1.08)	0.4198	1.02	(0.77, 1.34)	0.8902
Mean Wind Speed (m/s)	*1.8*	1.39	(0.95, 2.03)	0.0873	0.35	(0.07, 1.66)	0.1864
Precipitation (mm)	*2.3*	1.00	(0.98, 1.04)	0.5179	0.88	(0.73, 1.08)	0.221
Cloud Cover (%)	*4.0*	**1.03**	**(1.04, 1.31)**	**0.0106**	0.86	(0.54, 1.36)	0.5154

Table 33 Continued

		Damage			Disorderly Conduct		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.19	(0.98, 1.44)	0.0833	1.99	(0.88, 2.42)	0.0972
Observances		1.07	(0.84, 1.41)	0.61	2.35	(0.84, 2.31)	0.1052
Average of Daily 8-Hour Max CO (ppm)	*0.20*	**0.50**	**(0.46, 0.53)**	**<.0001**	**0.49**	**(0.33, 0.72)**	**0.0003**
Average of Daily 8-Hour Max O_3 (ppm)	*0.01*	**0.90**	**(0.83, 0.97)**	**0.0068**	0.88	(0.58, 1.35)	0.5638
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*4.2*	**1.29**	**(1.22, 1.37)**	**<.0001**	**1.95**	**(1.45, 2.61)**	**<.0001**
Average of Daily 1-Hour Max SO_2 (ppb)	*3.5*	**0.96**	**(0.92, 0.99)**	**0.0096**	1.00	(0.81, 1.24)	0.993
Apparent Temperature (C)	*11.5*	1.16	(0.11, 12.27)	0.9027	0.01	(0.00, 69350.16)	0.5865
Humidex	*12.3*	0.77	(0.08, 7.32)	0.8168	37.37	(0.00, 105126337.17)	0.6328
Mean Visibility (Km)	*1.6*	1.03	(0.99, 1.08)	0.1766	1.15	(0.94, 1.42)	0.1808
Mean Wind Speed (m/s)	*1.8*	0.90	(0.68, 1.18)	0.4375	0.74	(0.13, 4.25)	0.7386
Precipitation (mm)	*2.3*	0.98	(0.96, 1.00)	0.1214	1.06	(0.97, 1.16)	0.2172
Cloud Cover (%)	*4.0*	1.05	(0.97, 1.14)	0.2242	1.04	(0.64 1.69)	0.8632

		Harassment		
	IQR	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.03	(0.78, 1.35)	0.8494
Observances		1.17	(0.81, 1.68)	0.4029
Average of Daily 8-Hour Max CO (ppm)	*0.20*	**0.47**	**(0.43, 0.52)**	**<.0001**
Average of Daily 8-Hour Max O_3 (ppm)	*0.01*	**0.86**	**(0.77, 0.95)**	**0.0033**
Average of Daily Mean $PM_{2.5}$ (ug/m^3)	*4.2*	**1.23**	**(1.13, 1.33)**	**<.0001**
Average of Daily 1-Hour Max SO_2 (ppb)	*3.5*	**0.95**	**(0.91, 1.00)**	**0.0391**
Apparent Temperature (C)	*11.5*	0.27	(0.01, 6.77)	0.4259
Humidex	*12.3*	3.24	(0.15, 70.53)	0.4548
Mean Visibility (Km)	*1.6*	1.04	(0.98, 1.10)	0.2418
Mean Wind Speed (m/s)	*1.8*	0.79	(0.54, 1.14)	0.2044
Precipitation (mm)	*2.3*	1.00	(0.98, 1.03)	0.8748
Cloud Cover (%)	*4.0*	0.97	(0.87, 1.09)	0.6292

When looking across models, increases in CO concentrations resulted in decreases in crime with the exception of assault in the all location model, and for assault, burlgary, motor vehicle theft, robbery, damage and trespass crimes in the Chicago model. The models had few clearly statistically significant results for O_3 and decreases in crime incidents with the exception of motor vehicle theft in the Philadelphia model. Similarly, many of the results for PM_{10} were not statistically significant and the few that were resulted in a decrease in crimes when concentrations increased, with the exception being interfering with an officer in the Chicago model and rape and sex crimes in the Philadelphia model. Also, when $PM_{2.5}$ concentrations increased, crime incidents increased. This was most commonly found for assault crimes across models. Across models, except the Seattle model, increases in SO_2 concentrations resulted in increased crime incidents.

Across models, with the exception of the Seattle model, calculated apparent temperature values resulted in significant increases in crime when at the 75th percentile of the IQR compared to the 25th percentile. However, an increase in calculated humidex values resulted in a decrease in crime in most cases, with the exception of motor vehicle theft in the Chicago model and the model across study locations as well as homicide in the Houston model. When visibility was found to be a significant environmental factor, it always resulted in increased crimes. The cloud cover parameter had similar results. Finally, in many cases, increased wind speeds were associated with increases in crime. Table 34 summarizes these comparisons of statistical significance by environmental factor and crime type.

Table 34: Cross Model Comparison by Environmental Factor and Crime Type

	Crime Type	CO	NO_2	O_3	$PM_{2.5}$	PM_{10}	SO_2	AT	H	V	WS	P	CC
All	Assault	↑			↑			↑	↓	↑	↑		
	Burglary	↓											↑
	Homicide												
	Motor Vehicle Theft							↓	↑	↑	↓		
	Robbery			↓			↑			↑			↑
	Theft	↓		↓	↑			↑	↓	↑			
Chicago	Assault	↑			↑	↓		↑	↓	↑	↑		
	Burglary	↑	↓			↓	↑	↑	↓		↑		
	Homicide												
	Motor Vehicle Theft	↑	↓			↓	↑				↓		
	Robbery	↑		↓		↓	↑	↑					
	Theft					↓		↑	↓	↑			
	Arson and Reckless Burning					↓							
	Damage	↑			↑	↓		↑	↓	↑	↑		
	Interference with Officer	↓				↑	↑						↓
	Rape and Sex Crimes									↑			↑
	Trespass	↑	↑			↓					↑		
Houston	Assault												
	Burglary												
	Homicide							↓	↑				
	Motor Vehicle Theft						↓						
	Robbery												
	Theft												
	Rape and Sex Crimes	↓				↓							
Philadelphia	Assault							↑	↓		↑		
	Burglary					↓		↑					
	Homicide												
	Motor Vehicle Theft	↓	↑	↑		↓	↑			↑			
	Robbery					↓	↑	↑	↓	↑			↑
	Theft					↓		↑	↓		↑		
	Rape and Sex Crimes					↑	↓						
Seattle	Assault	↓			↑								
	Burglary	↓		↓	↑		↓						
	Homicide				↑								
	Motor Vehicle Theft	↓		↓	↑		↓						
	Robbery	↓		↓	↑								
	Theft	↓		↓	↑		↓				↓		
	Arson and Reckless Burning	↓			↑								
	Damage	↓		↓	↑		↓						
	Disorderly Conduct	↓			↑								
	Harassment	↓		↓	↑		↓						
	Trespass	↓		↓	↑								↑

Table 34 Continued

Legend

CO: Carbon Monoxide

NO_2: Nitrogen Dioxide

O_3: Ozone

$PM_{2.5}$: Particulate Matter 2.5 size fraction

PM_{10}: Particulate Matter 10 size fraction

SO_2: Sulfur Dioxide

AT: Apparent Temperature

H: Humidex

V: Visibility

WS: Wind Speed

P: Precipitation

CC: Cloud Cover

↑: Statistically significant increase in crime incidence when parameter increases from the 25^{th} percentile to the 75^{th} percentile

↓ Statistically significant decrease in crime incidence when parameter increases from the 25^{th} percentile to the 75^{th} percentile

☐ : Observation not significant

☐ (shaded) : Parameter not available for this model

Each of the aforementioned models were also run using air quality index (AQI) data to see if results could be more generalizable based on the current AQI information reported to determine the category of each day's air quality (i.e., good, moderate, unhealthy for sensitive populations, unhealthy and very unhealthy as matched to a color-coded system including flags flown at schools and agencies nationwide) (EPA, 2014; Shendell et al, 2007). Tables 35 through 40 summarize the results of these models with AQI information substituted for air pollution concentrations. When comparing the full model tables, Tables 28 and 34, the AQI used in place of air pollution concentrations produced similar results though more conservative. Increases in CO were borderline statistically significantly associated with increases in assault by 1.01 (CI: 1.00, 1.01) or 1% in the AQI model and 1.10 (CI: 1.04, 1.17) or 10% in the air pollution concentration model, and both models showed an increase of 1.03 or 3% when $PM_{2.5}$ increased from the 25th percentile to 75th percentile of concentrations. Similarly, thefts decreased by 0.99 in both models when SO_2 increased and robberies decreased by 0.97 and 0.96 when O_3 increased in the AQI and air pollution concentration models respectively.

When comparing the models for the four individual study cities, AQI again yielded similar or relatively more conservative results. In Chicago, the air pollution concentration model showed an increase in assault crimes of 1.45 (CI: 1.28, 1.64) or 45% when CO concntrations increased but 1.04 (CI: 1.03, 1.06) or 4% when the AQI increased. Similarly, the air pollution concentration model showed an increase in damage crimes of 1.97 (CI: 1.65, 2.34) or nearly a factor of two when CO concntrations increased but 1.08 (CI: 1.06, 1.10) or 8% when the AQI increased. For the remaining models, the statistically significant levels (or borderline or not significant) were similar to the original results presented above for the air pollution concentration models. However, the magnitude of the association decreased in the AQI models.

Table 35: Crime across Study Locations Considering AQI and Environmental Parameters

		Assault			**Burglary**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**1.06**	**(1.03, 1.09)**	**0.0004**	**0.86**	**(0.81, 0.90)**	**<.0001**
Observances		1.03	(0.99, 1.07)	0.178	1.04	(0.97, 1.10)	0.2588
Average Daily AQI CO	*2.0*	1.01	(1.00, 1.01)	0.0003	0.99	(0.98, 1.00)	0.0012
Average Daily AQI O_3	*0.02*	1.00	(0.99 1.00)	0.1508	1.00	(0.99, 1.01)	0.7701
Average Daily AQI $PM_{2.5}$	*6.5*	**1.03**	**(1.02, 1.04)**	**<.0001**	1.01	(0.99, 1.02)	0.4206
Average Daily AQI SO_2	*4.7*	1.00	(0.99, 1.01)	0.6318	1.00	(0.99, 1.01)	0.7301
Apparent Temperature (C)	*18.6*	**1.78**	**(1.39, 2.27)**	**<.0001**	1.09	(0.77, 1.54)	0.6283
Humidex	*20.7*	**0.67**	**(0.52, 0.86)**	**0.0014**	0.95	(0.68, 1.34)	0.784
Mean Visibility (Km)	*1.6*	**1.02**	**(1.01, 1.02)**	**<.0001**	1.00	(1.00, 1.01)	0.2944
Mean Wind Speed (m/s)	*2.2*	**1.04**	**(1.02, 1.06)**	**0.0005**	0.98	(0.95, 1.01)	0.3059
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.0104	1.00	(1.00, 1.00)	0.550
Cloud Cover (%)	*5.0*	1.00	(0.99, 1.02)	0.7646	**1.04**	**(1.01, 1.06)**	**0.0014**
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.17	(0.99, 1.39)	0.0634	**0.90**	**(0.85, 0.96)**	**0.0005**
Observances		1.01	(0.81, 1.25)	0.9361	0.98	(0.90, 1.05)	0.5166
Average Daily AQI CO	*2.0*	1.02	(0.99, 1.05)	0.1445	0.99	(0.98, 1.00)	0.1759
Average Daily AQI O_3	*0.02*	1.01	(0.97, 1.05)	0.601	1.01	(1.00, 1.02)	0.1189
Average Daily AQI $PM_{2.5}$	*6.5*	1.03	(0.97, 1.10)	0.309	1.01	(0.99, 1.03)	0.2403
Average Daily AQI SO_2	*4.7*	1.03	(0.99, 1.07)	0.1037	1.01	(1.00, 1.02)	0.2461
Apparent Temperature (C)	*18.6*	1.91	(0.49, 7.37)	0.3499	**0.25**	**(0.17, 0.38)**	**<.0001**
Humidex	*20.7*	0.73	(0.19, 2.74)	0.6376	**3.85**	**(2.57, 5.79)**	**<.0001**
Mean Visibility (Km)	*1.6*	1.01	(0.99, 1.04)	0.245	1.01	(1.00, 1.02)	0.0466
Mean Wind Speed (m/s)	*2.2*	1.04	(0.92, 1.17)	0.5427	**0.89**	**(0.86, 0.93)**	**<.0001**
Precipitation (mm)	*1.3*	1.00	(0.99, 1.00)	0.5305	1.00	(1.00, 1.00)	0.4861
Cloud Cover (%)	*5.0*	1.04	(0.96, 1.13)	0.3167	1.01	(0.98, 1.04)	0.4486

Table 35 Continued							
		Robbery			**Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**0.93**	**(0.88, 0.97)**	**0.0016**	0.87	(0.83, 0.90)	<**.0001**
Observances		1.03	(0.97, 1.09)	0.4004	**0.93**	**(0.88, 0.99)**	**0.0134**
Average Daily AQI CO	*2.0*	1.00	(1.00, 1.01)	0.2706	**0.97**	**(0.96, 0.98)**	<**.0001**
Average Daily AQI O_3	*0.02*	0.97	(0.97, 0.98)	<**.0001**	**0.99**	**(0.98, 1.00)**	**0.0238**
Average Daily AQI $PM_{2.5}$	*6.5*	1.00	(0.99, 1.02)	0.9953	1.02	(1.00, 1.03)	0.0127
Average Daily AQI SO_2	*4.7*	1.01	(1.00, 1.02)	0.048	0.99	(0.98, 1.00)	0.0426
Apparent Temperature (C)	*18.6*	1.04	(0.74, 1.46)	0.8269	**1.55**	**(1.15, 2.09)**	**0.0039**
Humidex	*20.7*	1.02	(0.73, 1.43)	0.9118	**0.68**	**(0.51, 0.91)**	**0.0097**
Mean Visibility (Km)	*1.6*	1.01	(1.00, 1.01)	0.0059	1.01	(1.00, 1.02)	0.0002
Mean Wind Speed (m/s)	*2.2*	0.97	(0.94, 1.00)	0.0674	1.00	(0.97, 1.03)	0.9747
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.7082	1.00	(1.00, 1.00)	0.3405
Cloud Cover (%)	*5.0*	**1.05**	**(1.03, 1.07)**	<**.0001**	1.01	(1.00, 1.03)	0.1243

Table 36: Crime across Chicago, Houston and Philadelphia Considering AQI and Environmental Parameters

		Assault			**Burglary**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.04	(1.00, 1.08)	0.0486	**0.83**	**(0.78, 0.88)**	**0.0019**
Observances		1.04	(0.99, 1.09)	0.1572	1.06	(0.98, 1.15)	0.6654
Average Daily AQI CO	*3.0*	**1.03**	**(1.02, 1.04)**	**<.0001**	**1.04**	**(1.03, 1.06)**	**<.0001**
Average Daily AQI O_3	*16.7*	1.00	(0.99, 1.01)	0.7919	1.01	(0.99, 1.02)	0.0188
Average Daily AQI $PM_{2.5}$	*23.0*	**1.04**	**(1.03, 1.06)**	**<.0001**	1.01	(0.99, 1.03)	0.0428
Average Daily AQI SO_2	*5.2*	1.00	(1.00, 1.01)	0.4237	**1.02**	**(1.01, 1.03)**	**<.0001**
Average Daily AQI NO_2	*16.5*	1.01	(1.00, 1.03)	0.1344	0.98	(0.96, 1.00)	0.0442
Average Daily AQI PM_{10}	*15.5*	**0.97**	**(0.95, 0.98)**	**<.0001**	**0.95**	**(0.93, 0.97)**	**<.0001**
Apparent Temperature (C)	*22.1*	**2.67**	**(1.88, 3.81)**	**<.0001**	1.07	(0.65, 1.78)	<.0001
Humidex	*24.4*	**0.47**	**(0.33, 0.66)**	**<.0001**	1.01	(0.61, 1.66)	<.0001
Mean Visibility (Km)	*1.6*	**1.01**	**(1.01, 1.02)**	**<.0001**	1.00	(0.99, 1.00)	0.4028
Mean Wind Speed (m/s)	2.2	**1.08**	**(1.05, 1.11)**	**<.0001**	1.00	(0.97, 1.04)	<.0001
Precipitation (mm)	0.76	1.00	(1.00, 1.00)	0.1101	1.00	(1.00, 1.00)	0.3651
Cloud Cover (%)	5.0	1.00	(0.98, 1.02)	0.8744	1.02	(0.99, 1.05)	0.9782
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**1.34**	**(1.07, 1.68)**	**0.0114**	**0.892**	**(0.83, 0.96)**	**0.0019**
Observances		1.16	(0.85, 1.58)	0.3421	0.979	(0.89, 1.08)	0.6654
Average Daily AQI CO	*3.0*	1.00	(0.94, 1.07)	0.9914	**1.039**	**(1.02, 1.06)**	**<.0001**
Average Daily AQI O_3	*16.7*	1.04	(0.98, 1.11)	0.1592	1.022	(1.00, 1.04)	0.0188
Average Daily AQI $PM_{2.5}$	*23.0*	1.00	(0.91, 1.09)	0.9503	1.026	(1.00, 1.05)	0.0428
Average Daily AQI SO_2	*5.2*	1.03	(0.98, 1.08)	0.1926	**1.031**	**(1.02, 1.05)**	**<.0001**
Average Daily AQI NO_2	*16.5*	1.04	(0.95, 1.14)	0.4379	0.974	(0.95, 1.00)	0.0442
Average Daily AQI PM_{10}	*15.5*	1.03	(0.95, 1.11)	0.466	**0.952**	**(0.93, 0.97)**	**<.0001**
Apparent Temperature (C)	*22.1*	1.59	(0.18, 14.30)	0.6797	**0.138**	**(0.08, 0.25)**	**<.0001**
Humidex	*24.4*	0.87	(0.10, 7.51)	0.902	**7.087**	**(3.90, 12.87)**	**<.0001**
Mean Visibility (Km)	*1.6*	1.00	(0.97, 1.04)	0.8613	1.004	(0.99, 1.01)	0.4028
Mean Wind Speed (m/s)	2.2	1.04	(0.88, 1.23)	0.6677	**0.889**	**(0.85, 0.93)**	**<.0001**
Precipitation (mm)	0.76	1.00	(0.99, 1.00)	0.5387	0.999	(1.00, 1.00)	0.3651
Cloud Cover (%)	5.0	0.98	(0.88, 1.10)	0.7753	1.000	(0.97, 1.03)	0.9782

Table 36 Continued

		Robbery			Theft		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**0.92**	**(0.88, 0.97)**	**0.0141**	**0.87**	**(0.83, 0.92)**	**<.0001**
Observances		**1.09**	**(1.01, 1.18)**	**0.0362**	0.95	(0.89, 1.02)	0.1492
Average Daily AQI CO	3.0	**1.04**	**(1.02, 1.05)**	**<.0001**	1.01	(0.99, 1.02)	0.2907
Average Daily AQI O_3	16.7	**0.98**	**(0.96, 0.99)**	**0.0088**	1.00	(0.99, 1.01)	0.6276
Average Daily AQI $PM_{2.5}$	23.0	1.01	(0.99, 1.03)	0.4097	1.00	(0.99, 1.02)	0.7657
Average Daily AQI SO_2	5.2	1.01	(1.00, 1.02)	0.280	1.00	(0.99, 1.01)	0.8164
Average Daily AQI NO_2	16.5	1.00	(0.97, 1.02)	0.6466	1.00	(0.98, 1.02)	0.9732
Average Daily AQI PM_{10}	15.5	**0.97**	**(0.95, 0.99)**	**0.001**	**0.97**	**(0.96, 0.99)**	**0.0001**
Apparent Temperature (C)	22.1	1.15	(0.67, 1.98)	0.6097	1.05	(0.71, 1.56)	0.7994
Humidex	24.4	0.95	(0.75, 1.46)	0.8526	1.05	(0.71, 1.54)	0.8089
Mean Visibility (Km)	1.6	1.00	(1.00, 1.01)	0.3815	1.00	(1.00, 1.01)	0.3655
Mean Wind Speed (m/s)	2.2	0.99	(0.95, 1.03)	0.6686	0.99	(0.96, 1.02)	0.7021
Precipitation (mm)	0.76	1.00	(1.00, 1.00)	0.6781	1.00	(1.00, 1.00)	0.1395
Cloud Cover (%)	5.0	**1.04**	**(1.01, 1.07)**	**0.0061**	1.00	(0.98, 1.02)	0.7448

		Rape & Sex Crimes		
	IQR	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**1.61**	**(1.43, 1.82)**	**<.0001**
Observances		0.90	(0.73, 1.11)	0.3313
Average Daily AQI CO	3.0	0.99	(0.69, 1.03)	0.7934
Average Daily AQI O_3	16.7	1.02	(0.98, 1.05)	0.4591
Average Daily AQI $PM_{2.5}$	23.0	1.00	(0.95, 1.05)	0.9392
Average Daily AQI SO_2	5.2	1.00	(0.97, 1.03)	0.8662
Average Daily AQI NO_2	16.5	0.98	(0.92, 1.03)	0.3848
Average Daily AQI PM_{10}	15.5	1.01	(0.97, 1.06)	0.6254
Apparent Temperature (C)	22.1	0.56	(0.15, 2.15)	0.4004
Humidex	24.4	2.08	(0.56, 7.79)	0.2757
Mean Visibility (Km)	1.6	**1.04**	**(1.01, 1.06)**	**0.0007**
Mean Wind Speed (m/s)	2.2	0.93	(0.84, 1.03)	0.1793
Precipitation (mm)	0.76	1.00	(1.00, 1.00)	0.9362
Cloud Cover (%)	5.0	**1.11**	**(1.03, 1.18)**	**0.0041**

Table 37: Crime in Chicago Considering Daily Air Quality Index (AQI) and Environmental Parameters

		Assault			**Burglary**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.03	(0.99, 1.07)	0.1352	**0.84**	**(0.79, 0.89)**	**<.0001**
Observances		1.03	(0.97, 1.09)	0.3044	**1.09**	**(1.01, 1.18)**	**0.0256**
Average Daily AQI CO	*4.0*	**1.04**	**(1.03, 1.06)**	**<.0001**	**1.09**	**(1.07, 1.11)**	**<.0001**
Average Daily AQI O_3	*18.1*	1.00	(0.99, 1.01)	0.9743	1.01	(0.99, 1.02)	0.5592
Average Daily AQI $PM_{2.5}$	*24.0*	**1.05**	**(1.03, 1.06)**	**<.0001**	1.01	(0.99, 1.04)	0.2001
Average Daily AQI SO_2	*5.7*	1.00	(1.00, 1.01)	0.3487	**1.03**	**(1.02, 1.04)**	**<.0001**
Average Daily AQI NO_2	*15.0*	1.01	(1.00, 1.02)	0.1506	0.98	(0.96, 1.00)	0.0178
Average Daily AQI PM_{10}	*15.5*	**0.97**	**(0.95, 0.98)**	**<.0001**	**0.94**	**(0.92, 0.95)**	**<.0001**
Apparent Temperature (C)	*22.6*	**3.62**	**(2.38, 5.51)**	**<.0001**	**2.01**	**(1.13, 3.58)**	**0.0181**
Humidex	*24.1*	**0.36**	**(0.24, 0.54)**	**<.0001**	**0.56**	**(0.32, 0.97)**	**0.0372**
Mean Visibility (Km)	*3.2*	**1.03**	**(1.02, 1.04)**	**<.0001**	0.99	(0.97, 1.00)	0.1141
Mean Wind Speed (m/s)	2.2	**1.11**	**(1.07, 1.15)**	**<.0001**	**1.06**	**(1.01, 1.11)**	**0.011**
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.3692	1.00	(1.00, 1.00)	0.6213
Cloud Cover (%)	*4.0*	1.00	(0.98, 1.01)	0.8711	1.02	(1.00, 1.04)	0.0533
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**1.32**	**(1.01, 1.73)**	**0.0438**	**0.91**	**(0.85, 0.98)**	**0.0091**
Observances		1.27	(0.89, 1.80)	0.1818	0.96	(0.87, 1.06)	0.4225
Average Daily AQI CO	*4.0*	1.01	(0.91, 1.12)	0.8098	**1.06**	**(1.04, 1.09)**	**<.0001**
Average Daily AQI O_3	*18.1*	1.04	(0.96, 1.13)	0.3124	1.02	(1.00, 1.05)	0.0302
Average Daily AQI $PM_{2.5}$	*24.0*	0.98	(0.88, 1.10)	0.7732	1.02	(1.00, 1.05)	0.0949
Average Daily AQI SO_2	*5.7*	1.03	(0.97, 1.09)	0.368	**1.05**	**(1.03, 1.06)**	**<.0001**
Average Daily AQI NO_2	*15.0*	0.97	(0.88, 1.08)	0.6161	**0.96**	**(0.94, 0.98)**	**0.001**
Average Daily AQI PM_{10}	*15.5*	1.07	(0.98, 1.18)	0.1398	**0.96**	**(0.94, 0.98)**	**0.0011**
Apparent Temperature (C)	*22.6*	1.16	(0.06, 23.25)	0.9239	**0.29**	**(0.14, 0.59)**	**0.0006**
Humidex	*24.1*	1.24	(0.07, 21.57)	0.8847	**3.27**	**(1.64, 6.51)**	**0.0008**
Mean Visibility (Km)	*3.2*	1.03	(0.95, 1.12)	0.493	1.00	(0.98, 1.02)	0.8977
Mean Wind Speed (m/s)	2.2	0.98	(0.77, 1.24)	0.8527	**0.94**	**(0.89, 0.99)**	**0.0275**
Precipitation (mm)	*1.3*	1.00	(0.99, 1.01)	0.9238	1.00	(1.00, 1.00)	0.2271
Cloud Cover (%)	*4.0*	1.01	(0.90, 1.13)	0.875	1.00	(0.98, 1.03)	0.8138

Table 37 Continued							
		Robbery			**Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**0.93**	**(0.87, 0.99)**	**0.0248**	0.91	(0.87, 0.94)	<**.0001**
Observances		1.05	(0.96, 1.15)	0.269	**0.93**	**(0.88, 0.99)**	**0.0181**
Average Daily AQI CO	*4.0*	1.06	(1.04, 1.08)	<**.0001**	1.01	(1.00, 1.02)	0.1293
Average Daily AQI O_3	*18.1*	**0.97**	**(0.95, 0.99)**	**0.0136**	0.99	(0.98, 1.00)	0.1321
Average Daily AQI $PM_{2.5}$	*24.0*	1.00	(0.98, 1.03)	0.6578	1.00	(0.99, 1.02)	0.712
Average Daily AQI SO_2	*5.7*	1.02	(1.00, 1.03)	0.0308	1.01	(1.00, 1.02)	0.0533
Average Daily AQI NO_2	*15.0*	1.01	(0.98, 1.03)	0.6228	0.99	(0.98, 1.01)	0.3388
Average Daily AQI PM_{10}	*15.5*	0.98	(0.96, 1.00)	0.0264	0.98	(0.97, 1.00)	0.0075
Apparent Temperature (C)	*22.6*	**2.33**	**(1.18, 4.59)**	**0.0143**	1.46	(0.98, 2.17)	0.0632
Humidex	*24.1*	**0.49**	**(0.26, 0.94)**	**0.0319**	0.77	(0.53, 1.13)	0.1789
Mean Visibility (Km)	*3.2*	1.00	(0.98, 1.01)	0.7402	1.01	(1.00, 1.02)	0.0241
Mean Wind Speed (m/s)	*2.2*	1.05	(1.00, 1.11)	0.0493	1.02	(0.99, 1.05)	0.2738
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.7654	1.00	(1.00, 1.00)	0.0744
Cloud Cover (%)	*4.0*	1.03	(1.00, 1.05)	0.0317	1.01	(0.99, 1.02)	0.4985
		Trespass			**Arson & Burning**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**0.77**	**(0.71, 0.84)**	<**.0001**	0.90	(0.67, 1.20)	0.4678
Observances		**0.78**	**(0.70, 0.88)**	<**.0001**	0.65	(0.41, 1.01)	0.0578
Average Daily AQI CO	*4.0*	**1.06**	**(1.03, 1.09)**	<**.0001**	1.05	(0.96, 1.16)	0.2907
Average Daily AQI O_3	*18.1*	1.00	(0.96, 1.01)	0.2616	1.05	(0.97, 1.24)	0.2358
Average Daily AQI $PM_{2.5}$	*24.0*	1.01	(0.99, 1.04)	0.3128	1.10	(0.99, 1.22)	0.0852
Average Daily AQI SO_2	*5.7*	1.00	(0.98, 1.01)	0.8129	1.03	(0.98, 1.09)	0.2649
Average Daily AQI NO_2	*15.0*	**1.05**	**(1.02, 1.07)**	**0.0003**	0.98	(0.89, 1.08)	0.701
Average Daily AQI PM_{10}	*15.5*	**0.95**	**(0.92, 0.97)**	<**.0001**	**0.90**	**(0.82, 0.98)**	**0.0191**
Apparent Temperature (C)	*22.6*	1.29	(0.60, 2.80)	0.5144	**17.33**	**(1.03, 291.03)**	**0.0474**
Humidex	*24.1*	0.84	(0.40, 1.78)	0.655	0.07	(0.00, 1.05)	0.054
Mean Visibility (Km)	*3.2*	1.02	(1.00, 1.04)	0.0687	1.06	(0.98, 1.15)	0.1146
Mean Wind Speed (m/s)	*2.2*	1.06	(1.00, 1.13)	0.0553	1.19	(0.95, 1.48)	0.1226
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.5043	1.00	(0.99, 1.01)	0.7146
Cloud Cover (%)	*4.0*	1.00	(0.99, 1.05)	0.2918	1.01	(0.91, 1.12)	0.8592

Table 37 Continued

		Damage			Rape and Sex Crimes		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.04	(0.98, 1.10)	0.1659	**1.72**	**(1.49, 4.42)**	**<.0001**
Observances		1.07	(0.99, 1.15)	0.0821	0.91	(0.71, 2.03)	0.4721
Average Daily AQI CO	*4.0*	**1.08**	**(1.06, 1.10)**	**<.0001**	1.01	(0.95, 1.08)	0.7285
Average Daily AQI O_3	*18.1*	0.99	(0.97, 1.01)	0.2937	1.01	(0.96, 1.07)	0.5866
Average Daily AQI $PM_{2.5}$	*24.0*	**1.04**	**(1.01, 1.06)**	**0.0019**	1.00	(0.93, 1.07)	0.9309
Average Daily AQI SO_2	*5.7*	1.00	(0.98, 1.01)	0.581	1.01	(0.97, 1.05)	0.7619
Average Daily AQI NO_2	*15.0*	1.00	(0.99, 1.02)	0.598	0.97	(0.91, 1.03)	0.338
Average Daily AQI PM_{10}	*15.5*	**0.93**	**(0.92, 0.95)**	**<.0001**	1.00	(0.94, 1.06)	0.8763
Apparent Temperature (C)	*22.6*	**9.79**	**(5.39, 17.77)**	**<.0001**	0.53	(0.08, 3.37)	0.505
Humidex	*24.1*	**0.13**	**(0.07, 0.23)**	**<.0001**	2.24	(0.38, 13.07)	0.3687
Mean Visibility (Km)	*3.2*	**1.03**	**(1.01, 1.05)**	**0.0003**	**1.08**	**(1.03, 1.14)**	**0.0019**
Mean Wind Speed (m/s)	*2.2*	**1.19**	**(1.14, 1.24)**	**<.0001**	0.94	(0.82, 1.09)	0.4093
Precipitation (mm)	*1.3*	1.00	(1.00, 1.00)	0.3458	1.00	(0.99, 1.00)	0.2382
Cloud Cover (%)	*4.0*	1.02	(1.00, 1.04)	0.0846	**1.10**	**(1.02, 1.17)**	**0.0097**

		Interference with Public Officer		
	IQR	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**1.72**	**(1.49, 1.99)**	**<.0001**
Observances		0.91	(0.71, 1.17)	0.4721
Average Daily AQI CO	*4.0*	1.01	(0.95, 1.08)	0.7285
Average Daily AQI O_3	*18.1*	1.01	(0.96, 1.07)	0.5866
Average Daily AQI $PM_{2.5}$	*24.0*	1.00	(0.93, 1.07)	0.9309
Average Daily AQI SO_2	*5.7*	1.01	(0.97, 1.05)	0.7619
Average Daily AQI NO_2	*15.0*	0.97	(0.91, 1.03)	0.338
Average Daily AQI PM_{10}	*15.5*	1.00	(.94, 1.06)	0.8763
Apparent Temperature (C)	*22.6*	0.53	(0.08, 3.37)	0.505
Humidex	*24.1*	2.24	(0.38, 13.07)	0.3687
Mean Visibility (Km)	*3.2*	**1.08**	**(1.03, 1.14)**	**0.0019**
Mean Wind Speed (m/s)	*2.2*	0.94	(0.82, 1.09)	0.4093
Precipitation (mm)	*1.3*	1.00	(0.99, 1.00)	0.2382
Cloud Cover (%)	*4.0*	**1.10**	**(1.02, 1.17)**	**0.0097**

Table 38: Crime in Houston Considering Daily Air Quality Index (AQI) and Environmental Parameters

Parameter		**Assault**			**Burglary**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		0.96	(0.76, 1.20)	0.699	**0.77**	**(0.61, 0.97)**	**0.0287**
Observances		1.12	(0.89, 1.41)	0.3547	1.10	(0.86, 1.41)	0.4385
Average Daily AQI CO	*1.4*	1.00	(0.97, 1.03)	0.883	0.99	(0.96, 1.02)	0.3877
Average Daily AQI O_3	*15.2*	1.02	(0.97, 1.06)	0.4358	1.00	(0.96, 1.04)	0.9754
Average Daily AQI $PM_{2.5}$	*18.6*	1.03	(0.96, 1.11)	0.3591	1.01	(0.95, 1.08)	0.7312
Average Daily AQI SO_2	*5.3*	0.99	(0.95, 1.04)	0.8241	0.99	(0.95, 1.03)	0.6192
Average Daily AQI NO_2	*17.4*	1.00	(0.90, 1.11)	0.9565	1.05	(0.95, 1.15)	0.3508
Average Daily AQI PM_{10}	*16.0*	0.99	(0.93, 1.05)	0.6397	0.97	(0.92, 1.03)	0.3122
Apparent Temperature (C)	*18.4*	2.02	(0.21, 19.73)	0.5453	0.90	(0.11, 7.50)	0.9208
Humidex	*21.1*	0.60	(0.06, 5.68)	0.6564	1.20	(0.15, 9.79)	0.8626
Mean Visibility (Km)	*1.6*	0.99	(0.96, 1.02)	0.6247	0.99	(0.96, 1.02)	0.4903
Mean Wind Speed (m/s)	2.2	1.05	(0.87, 1.25)	0.6185	0.99	(0.83, 1.17)	0.8672
Precipitation (mm)	*0.25*	1.00	(1.00, 1.00)	0.3175	1.00	(1.00, 1.00)	0.7084
Cloud Cover (%)	*4.0*	1.01	(0.93, 1.10)	0.7935	1.00	(0.92, 1.08)	0.9362
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.17	(0.53, 2.59)	0.6995	0.80	(0.63, 1.01)	0.061
Observances		0.29	(0.06, 1.37)	0.1189	0.99	(0.78, 1.27)	0.9574
Average Daily AQI CO	*1.4*	1.00	(0.88, 1.13)	0.9716	1.01	(0.98, 1.04)	0.6934
Average Daily AQI O_3	*15.2*	1.15	(0.99, 1.33)	0.0612	1.00	(0.96, 1.05)	0.8116
Average Daily AQI $PM_{2.5}$	*18.6*	1.04	(0.80, 1.35)	0.7627	1.01	(0.94, 1.08)	0.8277
Average Daily AQI SO_2	*5.3*	1.03	(0.87, 1.22)	0.7162	**0.93**	**(0.89, 0.97)**	**0.0016**
Average Daily AQI NO_2	*17.4*	1.16	(0.78, 1.73)	0.4682	0.99	(0.89, 0.98)	0.795
Average Daily AQI PM_{10}	*16.0*	0.94	(0.74, 1.19)	0.5808	0.99	(0.93, 1.04)	0.6252
Apparent Temperature (C)	*18.4*	**0.00**	**(0.00, 0.25)**	**0.0228**	0.69	(0.08, 6.10)	0.7412
Humidex	*21.1*	**23763.10**	**(4.65, 121638714)**	**0.0207**	1.46	(0.17, 12.46)	0.731
Mean Visibility (Km)	*1.6*	0.95	(0.84, 1.06)	0.3528	0.99	(0.96, 1.02)	0.6317
Mean Wind Speed (m/s)	2.2	0.54	(0.27, 1.08)	0.0796	0.94	(0.79, 1.12)	0.5104
Precipitation (mm)	*0.25*	1.00	(0.99, 1.00)	0.3169	1.00	(1.00, 1.00)	0.8271
Cloud Cover (%)	*4.0*	0.85	(0.61, 1.18)	0.3296	1.03	(0.95, 1.12)	0.4678

Table 38 Continued							
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		0.79	(0.61, 1.01)	0.063	**0.76**	**(0.61, 0.94)**	**0.0109**
Observances		1.20	(0.94, 1.53)	0.1389	1.00	(0.80, 1.25)	0.9707
Average Daily AQI CO	*1.4*	1.01	(0.98, 1.04)	0.5372	0.99	(0.97, 1.02)	0.593
Average Daily AQI O_3	*15.2*	1.01	(0.97, 1.06)	0.558	1.01	(0.97, 1.04)	0.7491
Average Daily AQI $PM_{2.5}$	*18.6*	1.04	(0.97, 1.12)	0.2767	1.01	(0.95, 1.07)	0.7362
Average Daily AQI SO_2	*5.3*	**0.95**	**(0.90, 0.99)**	**0.0264**	0.96	(0.92, 1.00)	0.0272
Average Daily AQI NO_2	*17.4*	0.93	(0.83, 1.04)	0.1807	1.00	(0.92, 1.09)	0.999
Average Daily AQI PM_{10}	*16.0*	0.95	(0.89, 1.01)	0.1123	0.98	(0.94, 1.03)	0.5185
Apparent Temperature (C)	*18.4*	0.21	(0.02, 2.27)	0.197	0.46	(0.07, 3.18)	0.433
Humidex	*21.1*	4.75	(0.44, 50.73)	0.1976	2.15	(0.32, 14.50)	0.4297
Mean Visibility (Km)	*1.6*	0.99	(0.96, 1.02)	0.5574	0.99	(0.97, 1.02)	0.5723
Mean Wind Speed (m/s)	*2.2*	0.85	(0.70, 1.03)	0.0893	0.92	(0.79, 1.07)	0.2816
Precipitation (mm)	*0.25*	1.00	(1.00, 1.00)	0.7831	1.00	(1.00, 1.00)	0.6742
Cloud Cover (%)	*4.0*	1.02	(0.93, 1.12)	0.6652	0.99	(0.92, 1.07)	0.8389

		Rape & Sex Crimes		
	IQR	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.04	(0.64, 1.89)	0.8654
Observances		0.69	(0.35, 1.41)	0.2917
Average Daily AQI CO	*1.4*	**0.92**	**(0.85, 0.99)**	**0.0316**
Average Daily AQI O_3	*15.2*	0.96	(0.87, 1.06)	0.4143
Average Daily AQI $PM_{2.5}$	*18.6*	1.16	(0.99, 1.35)	0.0629
Average Daily AQI SO_2	*5.3*	1.05	(0.95, 1.16)	0.3651
Average Daily AQI NO_2	*17.4*	1.06	(0.83, 1.35)	0.6463
Average Daily AQI PM_{10}	*16.0*	**0.85**	**(0.74, 0.99)**	**0.0319**
Apparent Temperature (C)	*18.4*	1.82	(0.01, 296.65)	0.818
Humidex	*21.1*	0.72	(0.00, 108.17)	0.8964
Mean Visibility (Km)	*1.6*	1.00	(0.93, 1.08)	0.9692
Mean Wind Speed (m/s)	*2.2*	0.95	(0.63, 1.42)	0.7957
Precipitation (mm)	*0.25*	1.00	(1.00, 1.00)	0.0106
Cloud Cover (%)	*4.0*	0.98	(0.81, 1.19)	0.833

Table 39: Crime in Philadelphia Considering Daily Air Quality Index (AQI) and Environmental Parameters

		Assault			Burglary		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		**1.22**	**(1.08, 1.39)**	**0.0013**	0.8798	(0.77, 1.01)	0.0717
Observances		1.11	(0.91, 1.35)	0.3111	**0.7552**	**(0.59, 0.96)**	**0.0237**
Average Daily AQI CO	*2.0*	1.01	(0.98, 1.03)	0.5381	0.9934	(0.97, 1.02)	0.5891
Average Daily AQI O_3	*16.5*	1.01	(0.98, 1.05)	0.5743	0.9918	(0.95, 1.03)	0.6287
Average Daily AQI $PM_{2.5}$	*26.2*	1.01	(0.96, 1.07)	0.6438	1.0455	(0.99, 1.11)	0.128
Average Daily AQI SO_2	*5.0*	1.01	(0.99, 1.04)	0.3236	1.0141	(0.99, 1.04)	0.3222
Average Daily AQI NO_2	*14.0*	1.00	(0.95, 1.05)	0.9808	1.0169	(0.97, 1.07)	0.4873
Average Daily AQI PM_{10}	*13.0*	0.96	(0.93, 1.00)	0.0331	**0.9555**	**(0.92, 0.99)**	**0.0123**
Apparent Temperature (C)	*21.5*	**10.74**	**(3.24, 35.66)**	**0.0001**	**3.7357**	**(1.04, 13.40)**	**0.043**
Humidex	*23.3*	**0.13**	**(0.04, 0.40)**	**0.0004**	0.3154	(0.09, 1.06)	0.0629
Mean Visibility (Km)	*3.2*	1.02	(0.99, 1.06)	0.1509	1.0218	(0.99, 1.06)	0.2136
Mean Wind Speed (m/s)	2.2	**1.17**	**(1.06, 1.28)**	**0.0015**	1.0945	(0.99, 1.21)	0.0782
Precipitation (mm)	*1.02*	1.00	(1.00, 1.00)	0.4485	1.0009	(1.00, 1.00)	0.5694
Cloud Cover (%)	*5.0*	1.05	(0.99, 1.11	0.101	1.0387	(0.98, 1.10)	0.2112
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.32	(0.79, 2.20)	0.2844	0.80	(0.59, 1.09)	0.1525
Observances		1.44	(0.68, 3.07)	0.341	0.99	(0.63, 1.59)	0.9662
Average Daily AQI CO	*2.0*	0.95	(0.86, 1.05)	0.2765	**0.93**	**(0.88, 0.98)**	**0.0084**
Average Daily AQI O_3	*16.5*	0.97	(0.83, 1.12)	0.6417	**1.08**	**(1.01, 1.17)**	**0.0286**
Average Daily AQI $PM_{2.5}$	*26.2*	0.97	(0.77, 1.23)	0.7978	1.11	(0.98, 1.26)	0.0961
Average Daily AQI SO_2	*5.0*	1.04	(0.93, 1.15)	0.5277	**1.07**	**(1.01, 1.13)**	**0.0133**
Average Daily AQI NO_2	*14.0*	1.19	(0.98, 1.45)	0.074	**1.23**	**(1.11, 1.35)**	**<.0001**
Average Daily AQI PM_{10}	*13.0*	1.02	(0.88, 1.17)	0.824	**0.83**	**(0.77, 0.90)**	**<.0001**
Apparent Temperature (C)	*21.5*	6.99	(0.04, 1238.97)	0.4616	0.94	(0.06, 14.57)	0.9653
Humidex	*23.3*	0.21	(0.00, 29.52)	0.5404	1.41	(0.10, 19.27)	0.7952
Mean Visibility (Km)	*3.2*	0.96	(0.84, 1.10)	0.5712	1.08	(1.00, 1.16)	0.0512
Mean Wind Speed (m/s)	2.2	1.15	(0.77, 1.74)	0.4934	1.08	(0.87, 1.34)	0.4881
Precipitation (mm)	*1.02*	0.99	(0.97, 1.00)	0.1212	1.00	(0.99, 1.01)	0.8256
Cloud Cover (%)	*5.0*	0.92	(0.72, 1.18)	0.519	1.02	(0.90, 1.16)	0.7111

Table 39 Continued							
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.02	(0.90, 1.15)	0.7856	**0.81**	**(0.75, 0.87)**	<**.0001**
Observances		1.10	(0.91, 1.33)	0.3239	0.90	(0.80, 1.02)	0.1043
Average Daily AQI CO	*2.0*	1.01	(0.98, 1.03)	0.6061	1.00	(0.99, 1.01)	0.9338
Average Daily AQI O_3	*16.5*	0.97	(0.93, 1.00)	0.0609	1.00	(0.98, 1.02)	0.7943
Average Daily AQI $PM_{2.5}$	*26.2*	1.03	(0.98, 1.09)	0.2433	1.00	(0.97, 1.03)	0.8192
Average Daily AQI SO_2	*5.0*	1.03	(1.00, 1.05)	0.0212	1.01	(1.00, 1.03)	0.1241
Average Daily AQI NO_2	*14.0*	0.96	(0.83, 1.04)	0.1097	1.00	(0.97, 1.02)	0.7409
Average Daily AQI PM_{10}	*13.0*	0.95	(0.89, 1.01)	0.0036	**0.96**	**(0.94, 0.98)**	<**.0001**
Apparent Temperature (C)	*21.5*	**6.15**	**(0.02, 2.27)**	**0.0022**	**2.73**	**(1.39, 5.36)**	**0.0035**
Humidex	*23.3*	**0.19**	**(0.44, 50.73)**	**0.003**	**0.45**	**(0.24, 0.86)**	**0.0158**
Mean Visibility (Km)	*3.2*	1.03	(0.96, 1.02)	0.0365	1.00	(0.98, 1.02)	0.8444
Mean Wind Speed (m/s)	*2.2*	1.08	(0.70, 1.03)	0.0985	**1.06**	**(1.01, 1.12)**	**0.0305**
Precipitation (mm)	*1.02*	1.00	(1.00, 1.00)	0.0036	1.00	(1.00, 1.00)	0.1791
Cloud Cover (%)	*5.0*	**1.06**	**(0.93, 1.12)**	**0.0373**	0.98	(0.95, 1.01)	0.2447

Parameter		**Rape & Sex Crimes**		
	IQR	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.09	(0.80, 2.23)	0.5781
Observances		0.87	(0.50, 1.65)	0.6318
Average Daily AQI CO	*2.0*	0.97	(0.92, 1.04)	0.4076
Average Daily AQI O_3	*16.5*	1.00	(0.91, 1.09)	0.9455
Average Daily AQI $PM_{2.5}$	*26.2*	0.93	(0.81, 1.07)	0.326
Average Daily AQI SO_2	*5.0*	**0.89**	**(0.83, 0.97)**	**0.0054**
Average Daily AQI NO_2	*14.0*	1.07	(0.95, 1.20)	0.2578
Average Daily AQI PM_{10}	*13.0*	**1.21**	**(1.11, 1.31)**	<**.0001**
Apparent Temperature (C)	*21.5*	0.79	(0.04, 16.61)	0.8797
Humidex	*23.3*	1.40	(0.08, 25.31)	0.821
Mean Visibility (Km)	*3.2*	1.05	(0.96, 1.13)	0.2785
Mean Wind Speed (m/s)	*2.2*	0.95	(0.75, 1.21)	0.6934
Precipitation (mm)	*1.02*	1.00	(0.99, 1.01)	0.7829
Cloud Cover (%)	*5.0*	1.05	(0.92, 1.21)	0.4667

Table 40: Crime in Seattle Considering Daily Air Quality Index (AQI) and Environmental Parameters

		Assault			**Burglary**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.07	(0.88, 1.32)	0.4865	0.89	(0.75, 1.09)	0.308
Observances		1.14	(0.88, 1.45)	0.3424	1.08	(0.81, 1.36)	0.788
Average Daily AQI CO	*3.0*	**0.44**	**(0.39, 0.45)**	**<.0001**	**0.48**	**(0.44, 0.50)**	**<.0001**
Average Daily AQI O_3	*11.0*	0.95	(0.87, 1.01)	0.1039	**0.88**	**(0.82, 0.94)**	**0.0002**
Average Daily AQI $PM_{2.5}$	*17.0*	**1.40**	**(1.32, 1.51)**	**<.0001**	**1.34**	**(1.28, 1.45)**	**<.0001**
Average Daily AQI SO_2	*6.0*	1.00	(0.94, 1.02)	0.2976	**0.99**	**(0.94, 0.9*)**	**0.001**
Apparent Temperature (C)	*11.5*	0.66	(0.04, 4.21)	0.4642	1.12	(0.09, 6.74)	0.837
Humidex	*12.3*	1.35	(0.23, 18.23)	0.5267	0.77	(0.14, 8.09)	0.962
Mean Visibility (Km)	*1.6*	1.00	(0.98, 1.07)	0.2105	0.98	(0.96, 1.03)	0.821
Mean Wind Speed (m/s)	1.8	0.89	(0.64, 1.09)	0.1941	0.99	(0.73, 1.19)	0.562
Precipitation (mm)	*2.3*	0.99	(0.98, 1.02)	0.7384	1.00	(0.99, 1.02)	0.697
Cloud Cover (%)	*4.0*	1.03	(0.92, 1.09)	0.9732	1.05	(0.94, 1.09)	0.74
		Homicide			**Motor Vehicle Theft**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.08	(0.29, 5.34)	0.7631	0.88	(0.70, 1.12)	0.3
Observances		0.00	(0.00, 0.00)	0.9997	1.07	(0.80, 1.42)	0.661
Average Daily AQI CO	*3.0*	0.69	(0.38, 1.13)	0.1318	**0.63**	**(0.59, 0.68)**	**<.0001**
Average Daily AQI O_3	*11.0*	1.01	(0.52, 1.83)	0.9323	**0.91**	**(0.84, 0.99)**	**0.023**
Average Daily AQI $PM_{2.5}$	*17.0*	1.19	(0.64, 2.04)	0.6428	**1.27**	**(1.18, 1.37)**	**<.0001**
Average Daily AQI SO_2	*6.0*	1.00	(0.68, 1.29)	0.6965	**0.93**	**(0.89, 0.98)**	**0.002**
Apparent Temperature (C)	*11.5*	4459647	(0.05, 157567465049595)	0.1558	1.16	(0.09, 14.72)	0.909
Humidex	*12.3*	0.00	(0.00, 205.59)	0.1661	0.80	(0.07, 9.07)	0.855
Mean Visibility (Km)	*1.6*	0.82	(0.62, 1.09)	0.17	1.00	(0.96, 1.05)	0.936
Mean Wind Speed (m/s)	1.8	4.70	(0.39, 32.19)	0.2606	0.96	(0.72, 1.29)	0.809
Precipitation (mm)	*2.3*	0.95	(0.77, 1.13)	0.4818	1.00	(0.98, 1.02)	0.758
Cloud Cover (%)	*4.0*	2.10	(0.84, 3.56)	0.1341	1.07	(0.97, 1.17)	0.164

Table 40 Continued

		Robbery			Theft		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		0.97	(0.80, 1.25)	0.9855	0.91	(0.79, 1.11)	0.457
Observances		1.18	(0.87, 1.51)	0.3445	1.04	(0.81, 1.28)	0.899
Average Daily AQI CO	*3.0*	**0.54**	**(0.50, 0.58)**	**<.0001**	**0.46**	**(0.42, 0.48)**	**<.0001**
Average Daily AQI O_3	*11.0*	**0.88**	**(0.82, 0.96)**	**0.004**	**0.91**	**(0.87, 0.98)**	**0.009**
Average Daily AQI $PM_{2.5}$	*17.0*	**1.34**	**(1.25, 1.45)**	**<.0001**	**1.41**	**(1.34, 1.51)**	**<.0001**
Average Daily AQI SO_2	*6.0*	1.00	(0.95, 1.03)	0.4982	**0.99**	**(0.95, 0.99)**	**0.002**
Apparent Temperature (C)	*11.5*	2.79	(0.14, 20.08)	0.6935	0.99	(0.07, 3.21)	0.438
Humidex	*12.3*	0.33	(0.05, 5.95)	0.6181	0.87	(0.28, 11.33)	0.538
Mean Visibility (Km)	*1.6*	1.02	(0.99, 1.08)	0.1554	1.00	(0.98, 1.05)	0.474
Mean Wind Speed (m/s)	*1.8*	1.08	(0.77, 1.37)	0.8785	0.93	(0.66, 1.04)	0.103
Precipitation (mm)	*2.3*	1.00	(0.98, 1.02)	0.8572	0.99	(0.97, 1.01)	0.176
Cloud Cover (%)	*4.0*	1.05	(0.97, 1.15)	0.2795	1.08	(0.98, 1.12)	0.151
		Trespass			**Arson & Reckless Burning**		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.10	(0.84, 1.47)	0.4554	2.30	(0.71, 5.34)	0.192
Observances		1.29	(0.82, 1.72)	0.3679	0.69	(0.11, 4.96)	0.761
Average Daily AQI CO	*3.0*	**0.45**	**(0.38, 0.48)**	**<.0001**	**0.26**	**(0.11, 0.41)**	**<.0001**
Average Daily AQI O_3	*11.0*	**0.82**	**(0.74, 0.91)**	**0.0003**	0.72	(0.50, 1.26)	0.327
Average Daily AQI $PM_{2.5}$	*17.0*	**1.43**	**(1.30, 1.58)**	**<.0001**	**1.67**	**(1.08, 2.48)**	**0.022**
Average Daily AQI SO_2	*6.0*	1.00	(0.90, 1.01)	0.1131	1.00	(0.76, 1.18)	0.631
Apparent Temperature (C)	*11.5*	**46.82**	**(1.32, 865.16)**	**0.0334**	1.40	(0.00, 12402.12)	0.557
Humidex	*12.3*	**0.02**	**(0.00, 0.70)**	**0.0291**	0.51	(0.00, 13077018.31)	0.594
Mean Visibility (Km)	*1.6*	1.02	(0.96, 1.08)	0.5167	1.08	(0.77, 1.34)	0.899
Mean Wind Speed (m/s)	*1.8*	1.54	(1.00, 2.12)	0.0494	0.77	(0.08, 1.94)	0.253
Precipitation (mm)	*2.3*	1.00	(0.98, 1.03)	0.5638	0.93	(0.73, 1.08)	0.235
Cloud Cover (%)	*4.0*	**1.05**	**(1.05, 1.33)**	**0.0043**	0.93	(0.55, 1.42)	0.604

Table 40 Continued

		Damage			Disorderly Conduct		
	IQR	Risk Ratio	Confidence Interval	P-Value	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.19	(1.00, 1.45)	0.0479	1.71	(0.88, 2.40)	0.099
Observances		1.08	(0.82, 1.38)	0.6462	2.09	(0.82, 2.28)	0.111
Average Daily AQI CO	*3.0*	**0.46**	**(0.41, 0.48)**	<**.0001**	**0.43**	**(0.29, 0.70)**	**0.0004**
Average Daily AQI O_3	*11.0*	**0.91**	**(0.84, 0.97)**	**0.0063**	0.85	(0.59, 1.40)	0.657
Average Daily AQI $PM_{2.5}$	*17.0*	**1.37**	**(1.29, 1.48)**	<**.0001**	**2.15**	**(1.61, 3.48)**	<**.0001**
Average Daily AQI SO_2	*6.0*	**0.97**	**(0.91, 0.98)**	**0.0037**	1.00	(0.77, 1.28)	0.959
Apparent Temperature (C)	*11.5*	2.10	(0.16, 14.35)	0.7229	0.48	(0.00, 119961.38)	0.627
Humidex	*12.3*	0.44	(0.07, 5.12)	0.633	1.33	(0.00, 2755156.87)	0.676
Mean Visibility (Km)	*1.6*	1.01	(0.99, 1.07)	0.1923	1.06	(0.93, 141)	0.209
Mean Wind Speed (m/s)	*1.8*	1.00	(0.72, 1.22)	0.6276	1.13	(0.14, 4.78)	0.824
Precipitation (mm)	*2.3*	0.98	(0.96, 1.00)	0.0977	1.05	(0.97, 1.16)	0.221
Cloud Cover (%)	*4.0*	1.11	(0.99, 1.16)	0.0867	1.15	(0.66, 1.77)	0.747

		Harassment		
	IQR	Risk Ratio	Confidence Interval	P-Value
Federal Holiday		1.04	(0.80, 1.36)	0.7613
Observances		1.15	(0.81, 1.64)	0.4326
Average Daily AQI CO	*3.0*	**0.41**	**(0.37, 0.46)**	<**.0001**
Average Daily AQI O_3	*11.0*	**0.85**	**(0.77, 0.94)**	**0.0022**
Average Daily AQI $PM_{2.5}$	*17.0*	**1.30**	**(1.18, 1.44)**	<**.0001**
Average Daily AQI SO_2	*6.0*	**0.94**	**(0.89, 0.99)**	**0.0235**
Apparent Temperature (C)	*11.5*	0.36	(0.02, 8.24)	0.5238
Humidex	*12.3*	2.43	(0.12, 48.21)	0.5607
Mean Visibility (Km)	*1.6*	1.04	(0.98, 1.10)	0.2443
Mean Wind Speed (m/s)	*1.8*	0.82	(0.57, 1.18)	0.2902
Precipitation (mm)	*2.3*	1.00	(0.98, 1.03)	0.8978
Cloud Cover (%)	*4.0*	0.99	(0.89, 1.10)	0.8378

Figures 14a through 14d present results of the crime types with statistically significant lag results in the all location model. Complete lag results appear in Appendix D. In the model across study cities, homicide crimes increased by 1.06 or 6% when $PM_{2.5}$ increased from the 25th percentile to 75th percentile with a one day lag. Homicide crimes also increased by 1.04 or 4% when SO_2 increased with a two day lag. Robbery crimes had a small increase with a five day lag when SO_2 was in the 75th percentile in comparison to the 25th percentile.

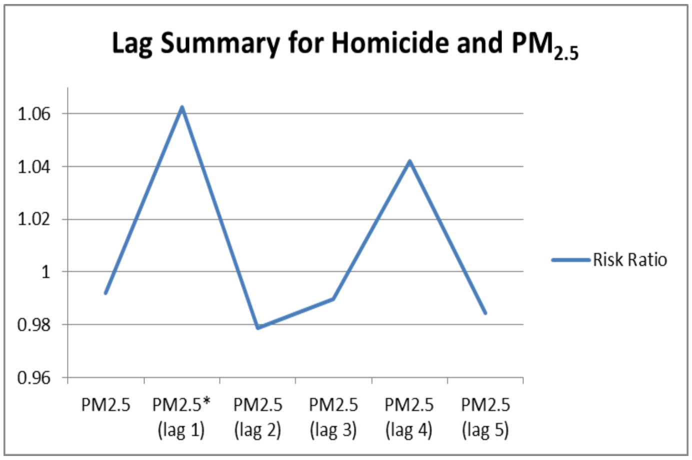
Figures 15a through 15ad summarize statistically significant lag results for the Chicago model. Arson and burning crimes showed lag results for CO and NO_2 with three day and four day lags, respecively. Assault crimes increased with a two day lag for NO_2. Robbery and trepass crimes also increased after NO_2 concrentrations increased four days prior and one/five days prior, respectively. The Chicago model suggested SO_2 concentrations had a lagged impact on homicide (lag 4), motor vehicle theft (lags 2, 3 and 5), rape and sex crimes (lag 4) and robbery (lag 2). Additionally, lags were observed in comparison to PM_{10} concentrations and burglary (lags 1-3), homicide (lag 1), interference with an officer (lag 3), and trespass (lag 2) for $PM_{2.5}$ concentrations. Burglary, damage and trespass results also suggested a lag relationship with CO.

Figures 16a through 16i present results from the Houston model. Similar to the Chicago model, a lag was observed between robbery and NO_2 (lags 1 and 2). The Houston model also suggested a lag relationship between burglary and NO_2 (lags 1 and 5), homicide and CO (lag 1) and assault and O_3 (lag 5).

Figures 17a through 17r present results for the Philadelphia model. Lags were observed with $PM_{2.5}$ for burglary (lag 4 and 5), homicide (lag 3), motor vehicle theft (lag 5) and rape and sex crimes (lag 1). Similarly, homicide (lag 3), motor vehicle theft (lag 5) and theft (lag 5) increased with CO concentrations with specific lag times. Lags were also found for NO_2 and rape and sex crimes (lag 1) and motor vehicle theft (lags 3 and 5). Finally, PM_{10} and homicide were associated with lags of one, three and four days.

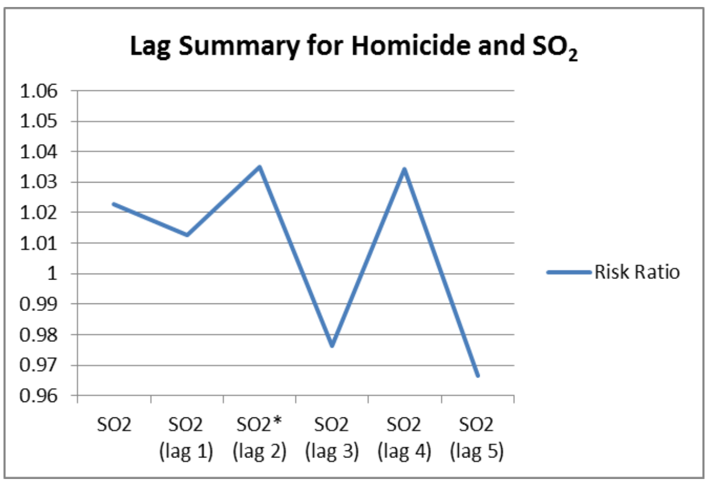
Figures 18a through 18ab summarized results of the Seattle model. Several of the significant observations found in this model were decreases in crimes observed after the initial lag zero (i.e., same day) conentration. There were significant increases in crime with $PM_{2.5}$ for disorderly conduct (lag 1) and homicide (lag 5), and with SO_2 for disorderly conduct (lag 2).

Figure 14a: Lag Summary for Homicide and Fine Particles ($PM_{2.5}$) across Study Locations



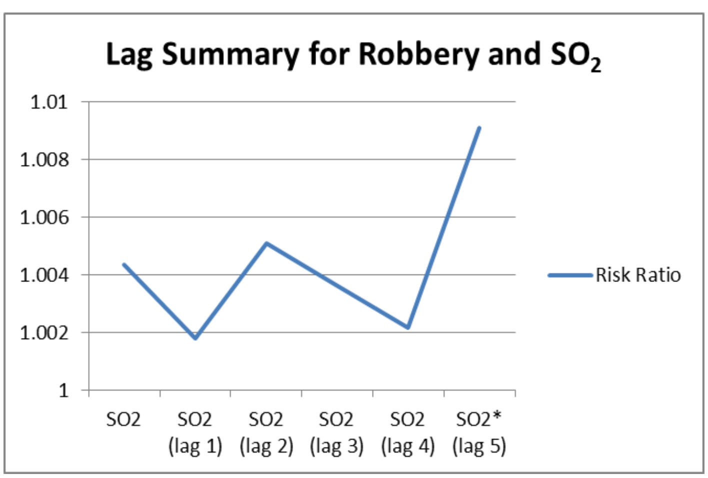
* Indicates statistical significance ($p \leq 0.05$)

Figure 14b: Lag Summary for Homicide and Sulfur Dioxide (SO_2) across Study Locations



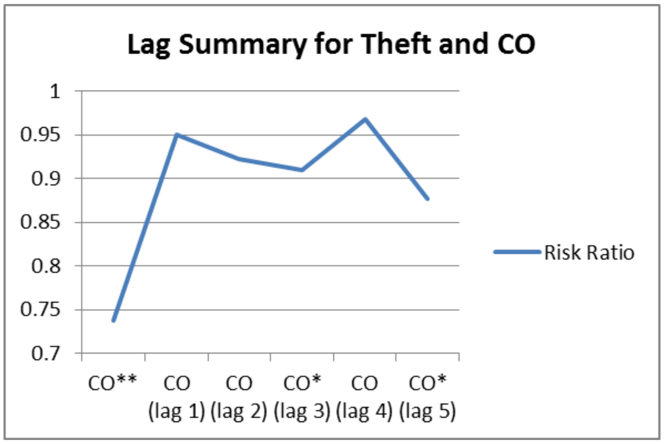
* Indicates statistical significance ($p \leq 0.05$)

Figure 14c: Lag Summary for Robbery and Sulfur Dioxide (SO_2) across Locations



* Indicates statistical significance ($p \leq 0.05$)

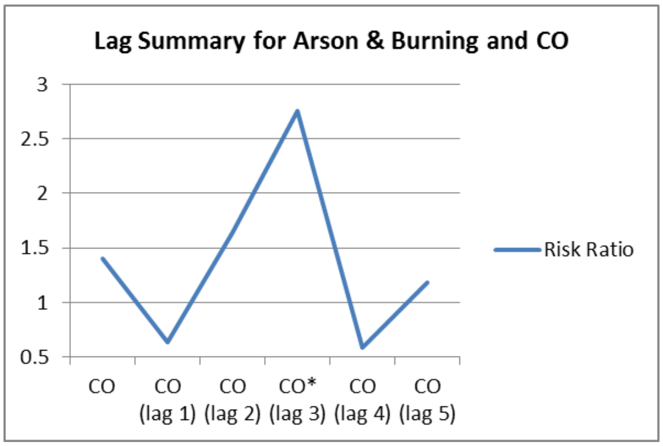
Figure 14d: Lag Summary for Theft and Carbon Monoxide (CO) across Study Locations



* Indicates statistical significance ($p \leq 0.05$)

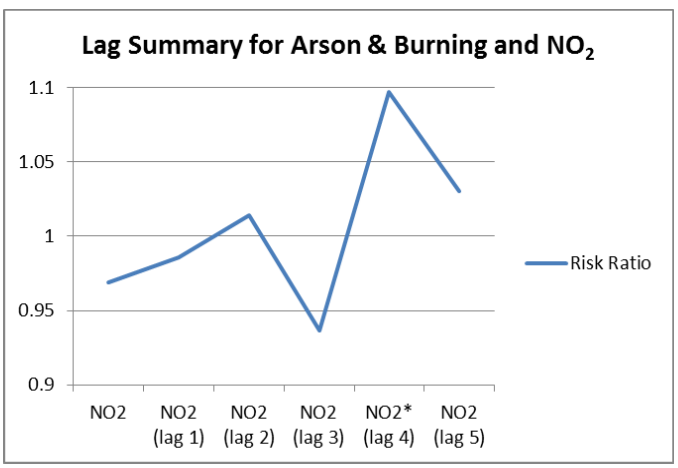
**Indicates statistical significance ($p < 0.0001$)

Figure 15a: Lag Summary for Arson and Burning and Carbon Monoxide (CO) for Chicago



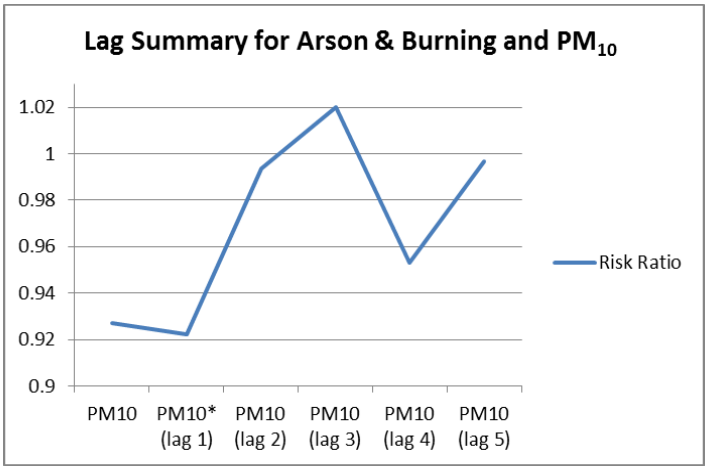
* Indicates statistical significance ($p \leq 0.05$)

Figure 15b: Lag Summary for Arson and Burning and Nitrogen Dioxide (NO_2) for Chicago



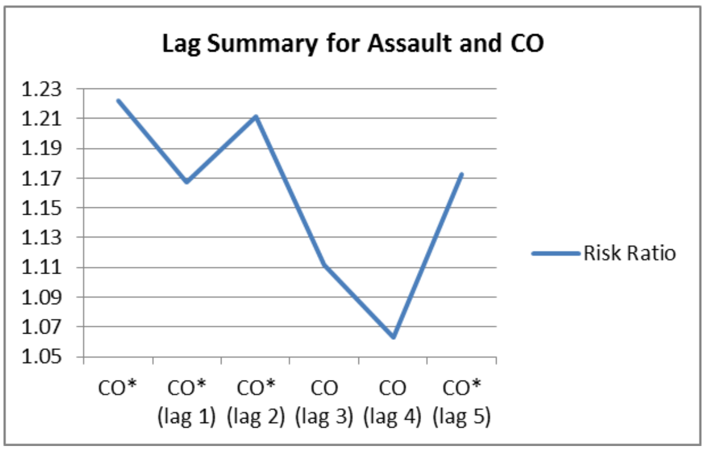
* Indicates statistical significance ($p \leq 0.05$)

Figure 15c: Lag Summary for Arson and Burning and Coarse Particles (PM_{10}) for Chicago



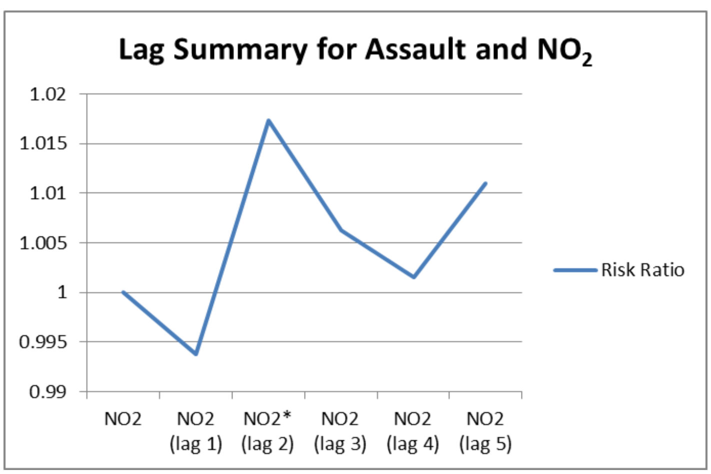
* Indicates statistical significance ($p \leq 0.05$)

Figure 15d: Lag Summary for Assault and Carbon Monoxide (CO) for Chicago



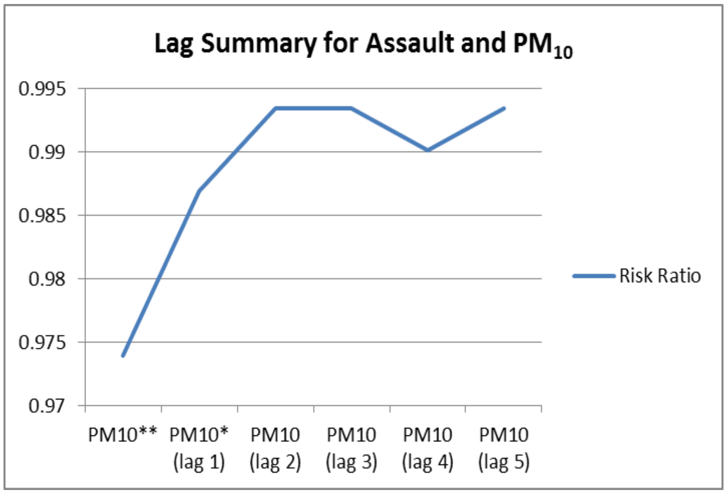
* Indicates statistical significance ($p \leq 0.05$)

Figure 15f: Lag Summary for Assault and Nitrogen Dioxide (NO_2) for Chicago



* Indicates statistical significance ($p \leq 0.05$)

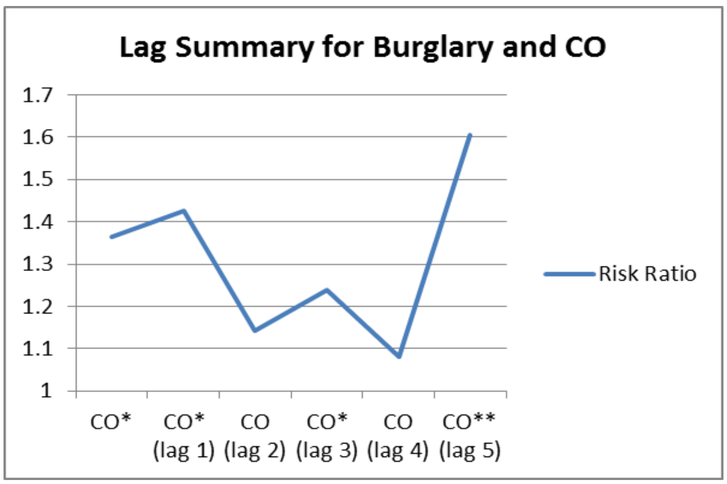
Figure 15g: Lag Summary for Assault and Coarse Particles (PM_{10}) for Chicago



* Indicates statistical significance (p≤0.05)

**Indicates statistical significance (p<0.0001)

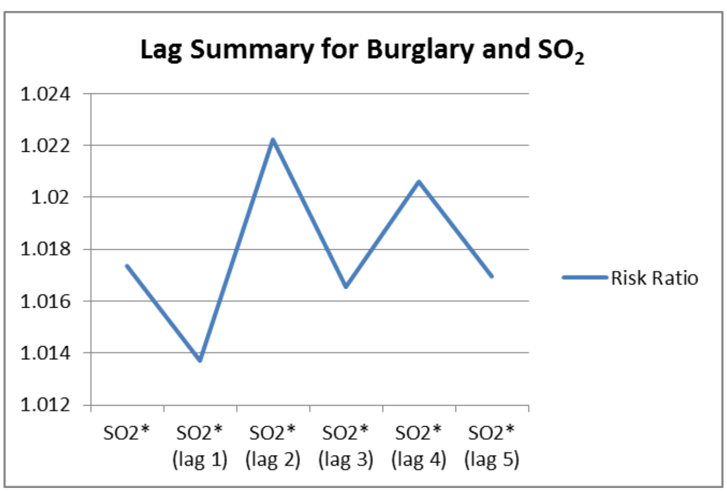
Figure 15h: Lag Summary for Burglary and Carbon Monoxide (CO) for Chicago



* Indicates statistical significance (p≤0.05)

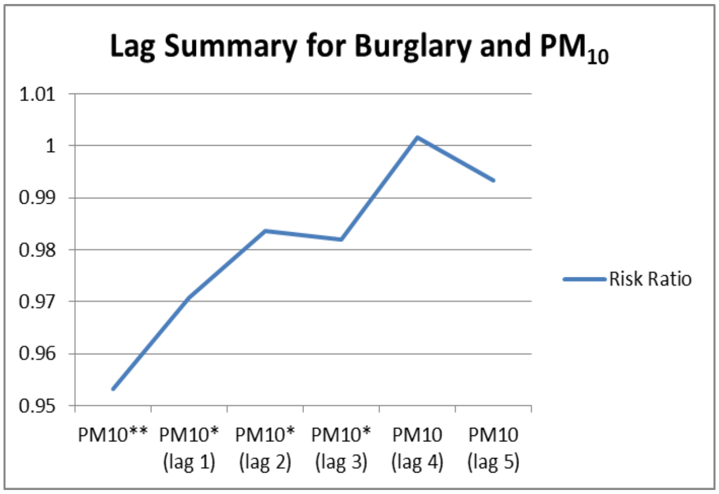
**Indicates statistical significance (p<0.0001)

Figure 15i: Lag Summary for Burglary and Sulfur Dioxide (SO_2) for Chicago



* Indicates statistical significance (p≤0.05)

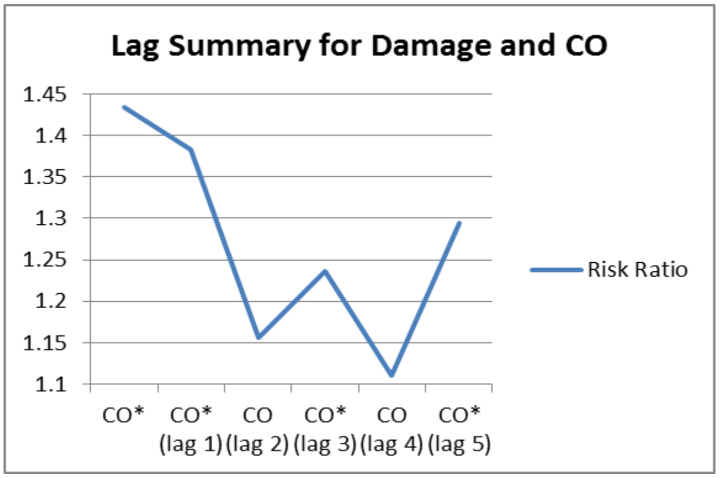
Figure 15j: Lag Summary for Burglary and Coarse Particles (PM_{10}) for Chicago



* Indicates statistical significance ($p \leq 0.05$)

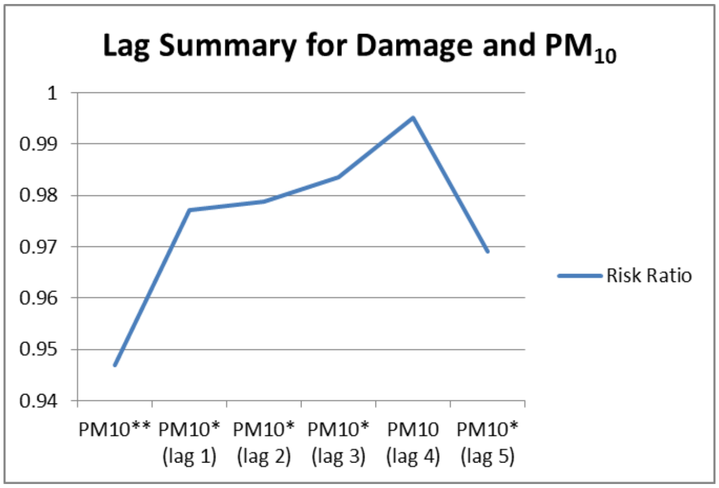
**Indicates statistical significance ($p < 0.0001$)

Figure 15k: Lag Summary for Damage and Carbon Monoxide (CO) for Chicago



* Indicates statistical significance ($p \leq 0.05$)

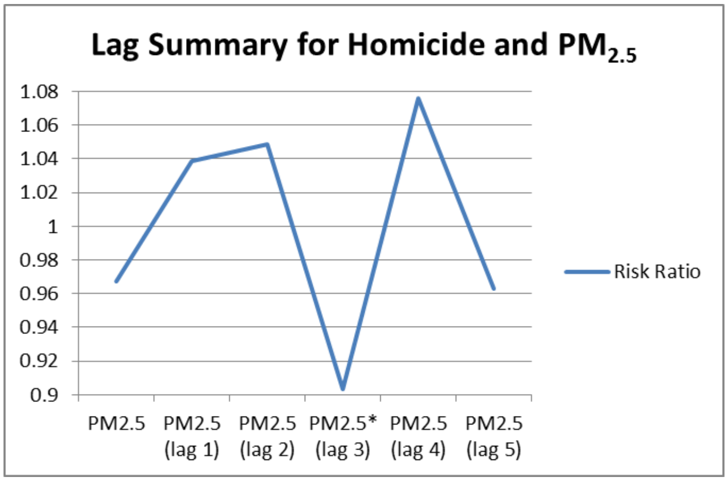
Figure 15l: Lag Summary for Damage and Coarse Particles (PM_{10}) for Chicago



* Indicates statistical significance ($p \leq 0.05$)

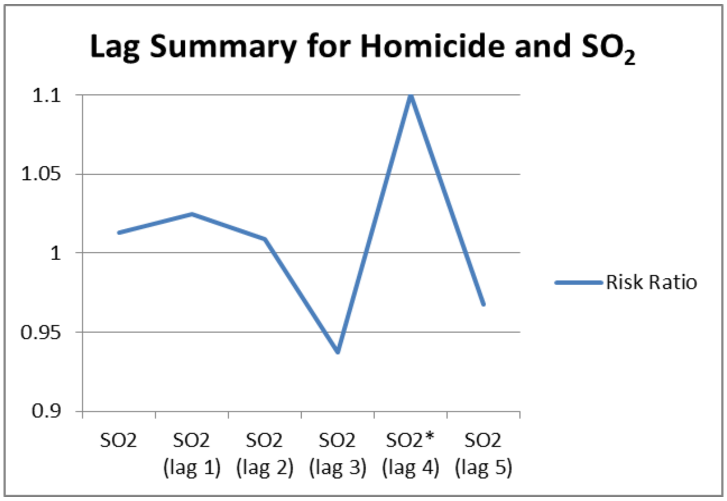
**Indicates statistical significance ($p < 0.0001$)

Figure 15m: Lag Summary for Homicide and Fine Particles ($PM_{2.5}$) for Chicago



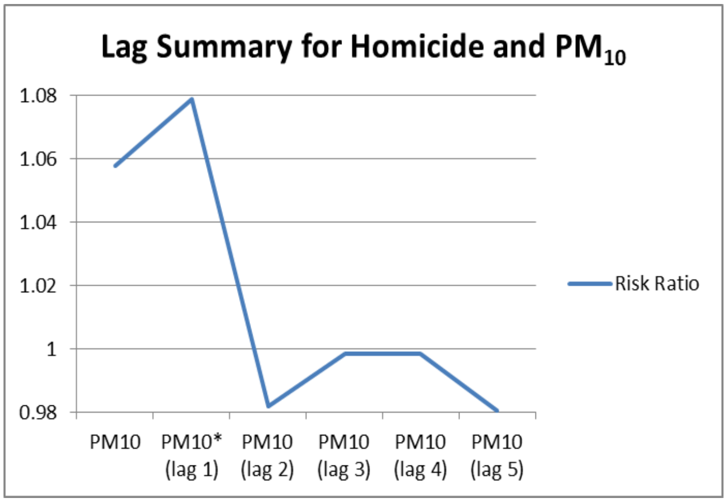
* Indicates statistical significance ($p \leq 0.05$)

Figure 15n: Lag Summary for Homicide and Sulfur Dioxide (SO_2) for Chicago



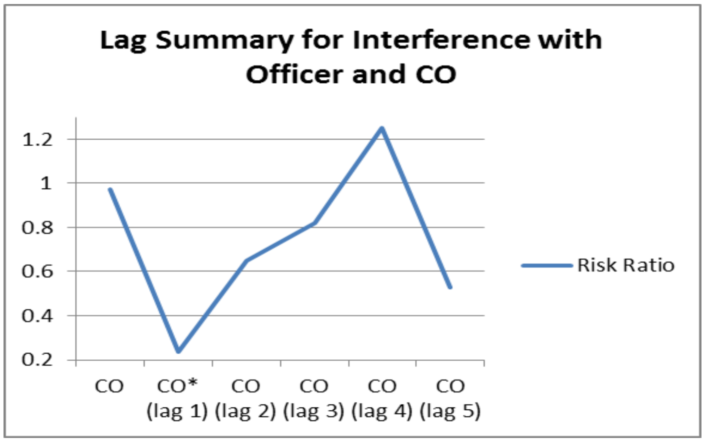
* Indicates statistical significance ($p \leq 0.05$)

Figure 15o: Lag Summary for Homicide and Coarse Particles (PM_{10}) for Chicago



* Indicates statistical significance ($p \leq 0.05$)

Figure 15p: Lag Summary for Interference with an Officer and Carbon Monoxide (CO) for Chicago



* Indicates statistical significance ($p \leq 0.05$)

Figure 15q: Lag Summary for Interference with an Officer and Nitrogen Dioxide (NO_2) for Chicago

* Indicates statistical significance ($p \leq 0.05$)

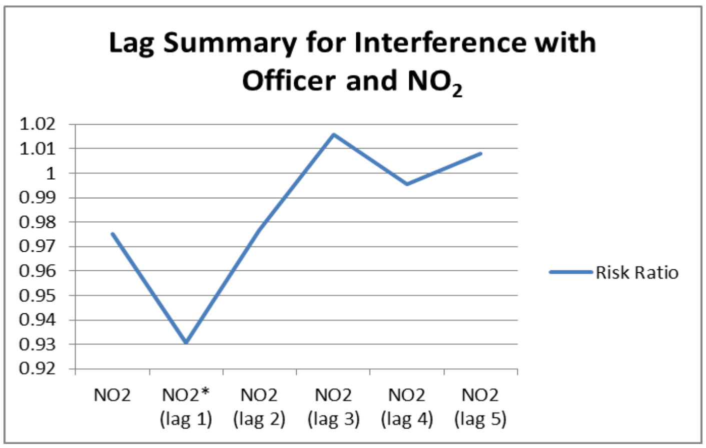
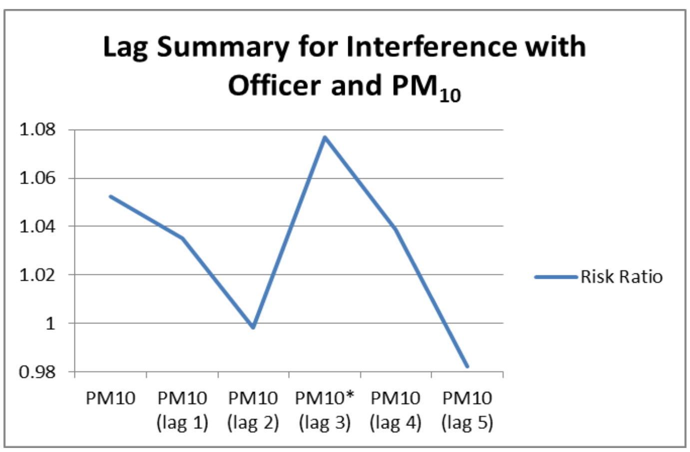
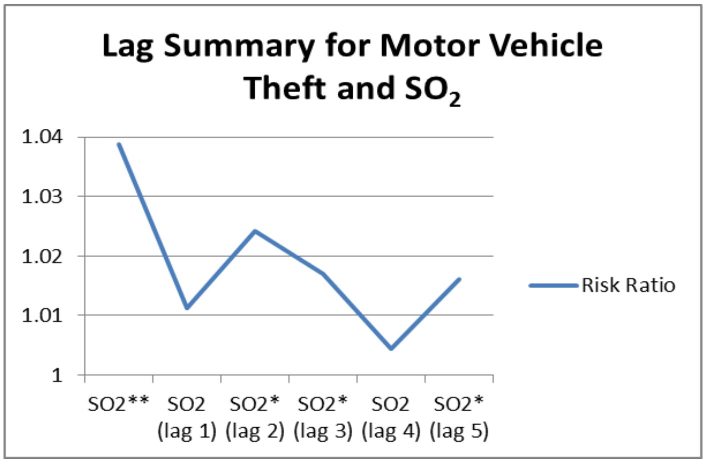


Figure 15r: Lag Summary for Interference with an Officer and Coarse Particles (PM_{10}) for Chicago



* Indicates statistical significance ($p \leq 0.05$)

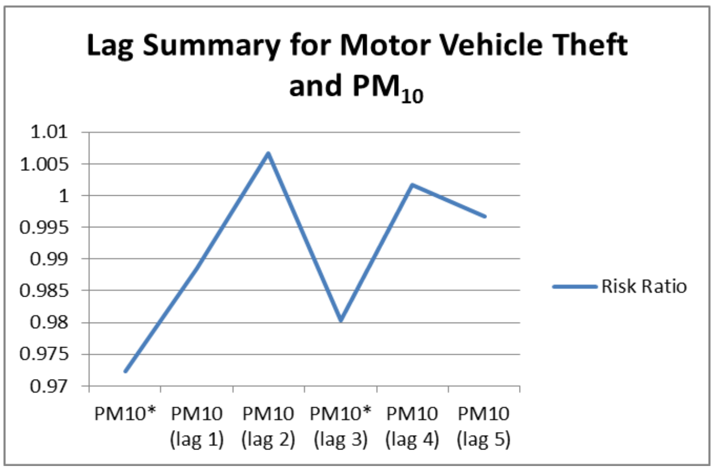
Figure 15s: Lag Summary for Motor Vehicle Theft and Sulfur Dioxide (SO_2) for Chicago



* Indicates statistical significance (p≤0.05)

**Indicates statistical significance (p<0.0001)

Figure 15t: Lag Summary for Motor Vehicle Theft and Coarse Particles (PM_{10}) for Chicago



* Indicates statistical significance (p≤0.05)

Figure 15u: Lag Summary for Rape and Sex Crimes and Fine Particles ($PM_{2.5}$) for Chicago

* Indicates statistical significance (p≤0.05)

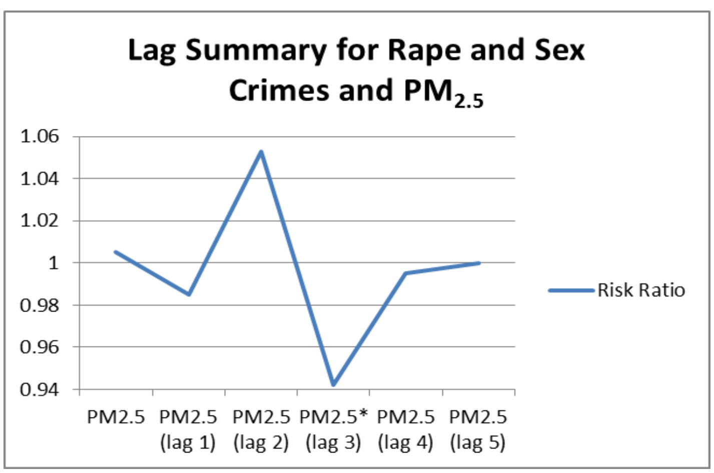
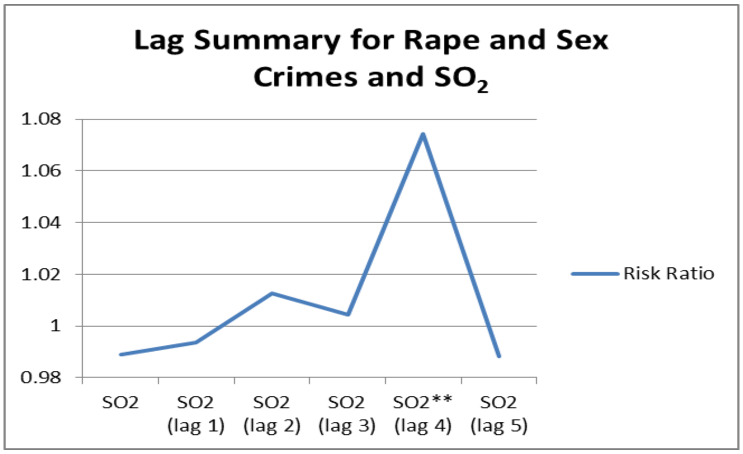
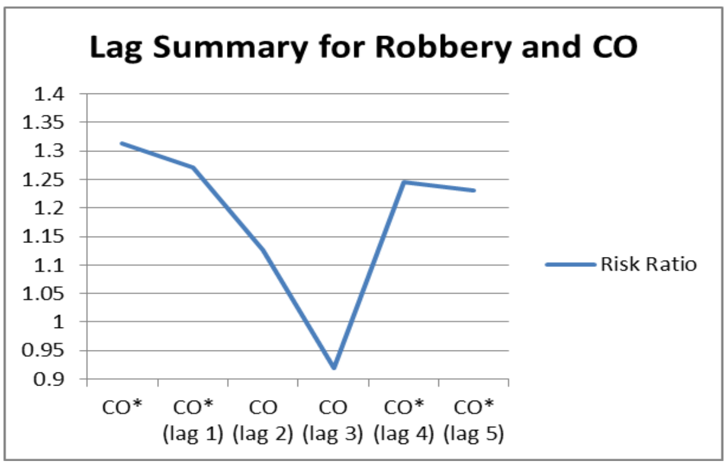


Figure 15v: Lag Summary for Rape and Sex Crimes and Sulfur Dioxide (SO_2) for Chicago



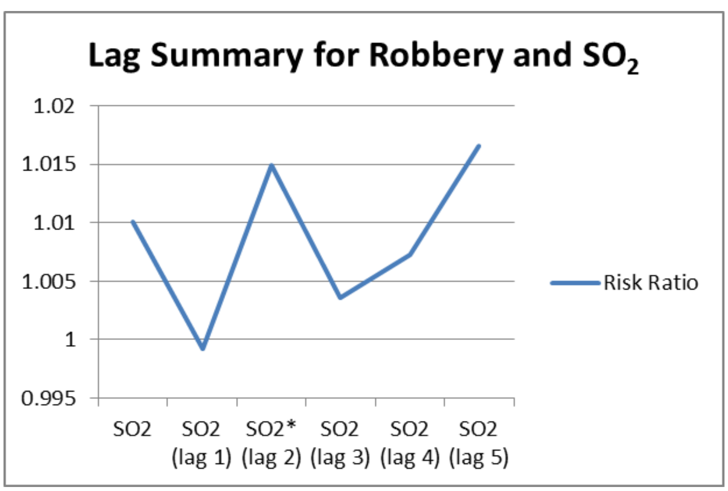
**Indicates statistical significance ($p<0.0001$)

Figure 15w: Lag Summary for Robbery and Carbon Monoxide (CO) for Chicago



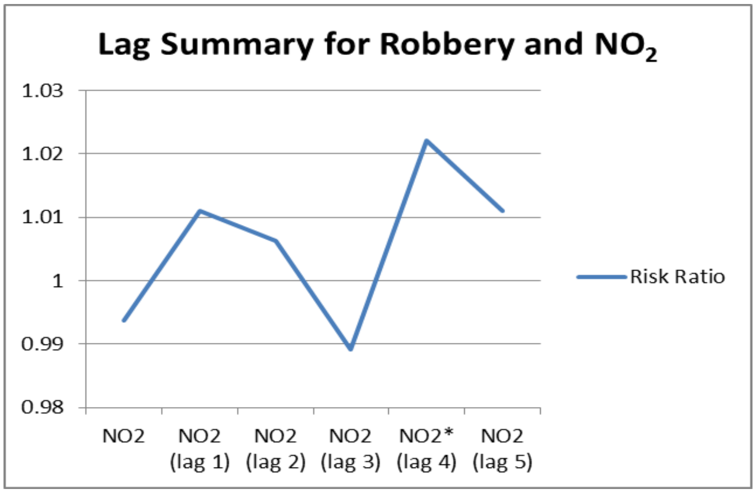
* Indicates statistical significance ($p\leq0.05$)

Figure 15x: Lag Summary for Robbery and Sulfur Dioxide (SO_2) for Chicago



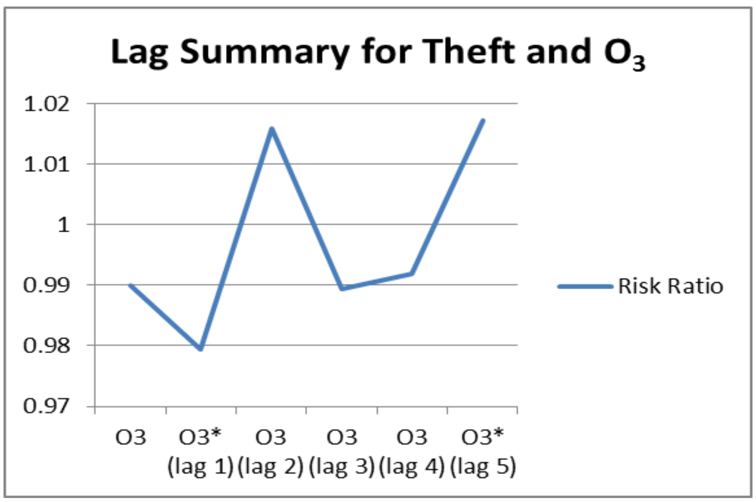
* Indicates statistical significance ($p\leq0.05$)

Figure 15y: Lag Summary for Robbery and Nitrogen Dioxide (NO_2) for Chicago



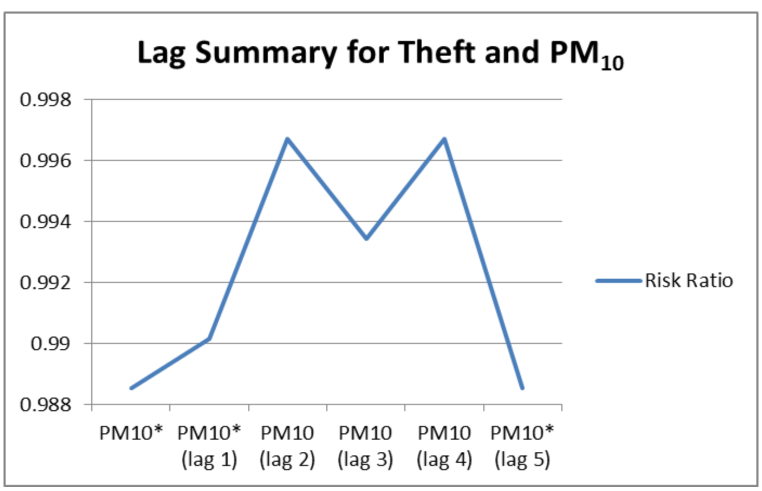
* Indicates statistical significance (p≤0.05)

Figure 15z: Lag Summary for Theft and Ozone (O_3) for Chicago



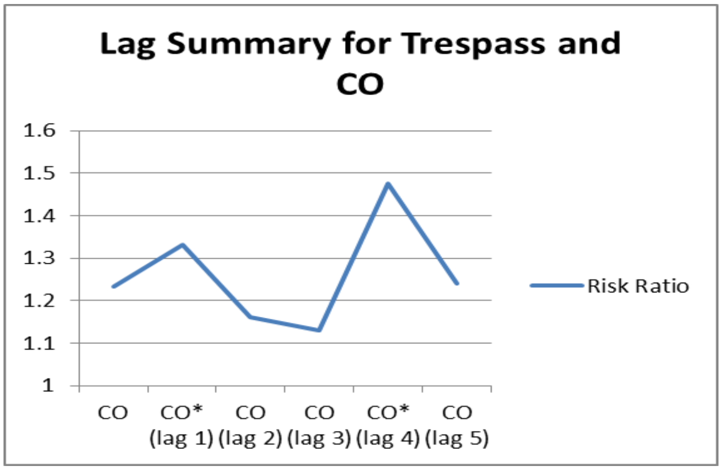
* Indicates statistical significance (p≤0.05)

Figure 15aa: Lag Summary for Theft and Coarse Particles (PM_{10}) for Chicago



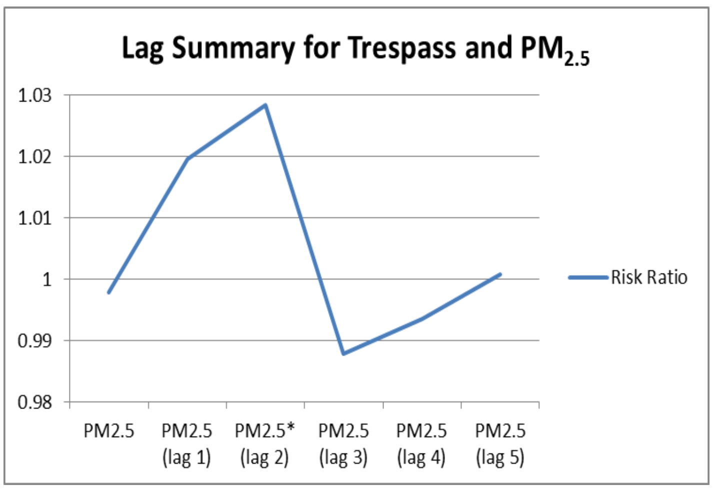
* Indicates statistical significance (p≤0.05)

Figure 15ab: Lag Summary for Trespass and Carbon Monoxide (CO) for Chicago



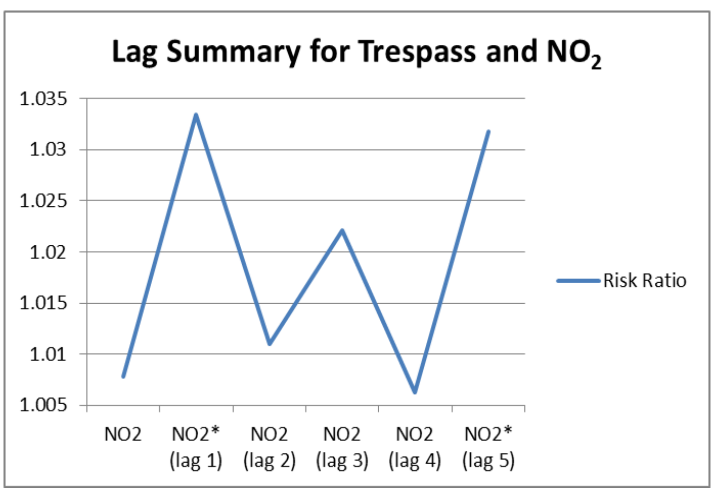
* Indicates statistical significance (p≤0.05)

Figure 15ac: Lag Summary for Trespass and Fine Particles ($PM_{2.5}$) for Chicago



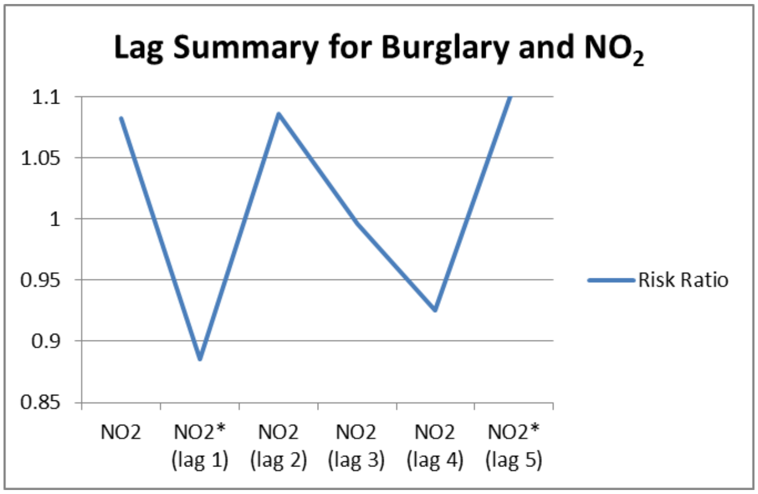
* Indicates statistical significance (p≤0.05)

Figure 15ad: Lag Summary for Trespass and Nitrogen Dioxide (NO_2) for Chicago



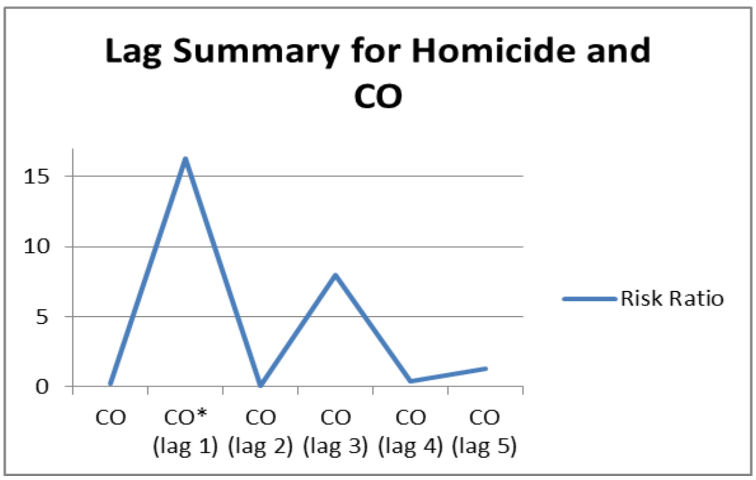
* Indicates statistical significance (p≤0.05)

Figure 16a: Lag Summary for Burglary and Nitrogen Dioxide (NO_2) for Houston



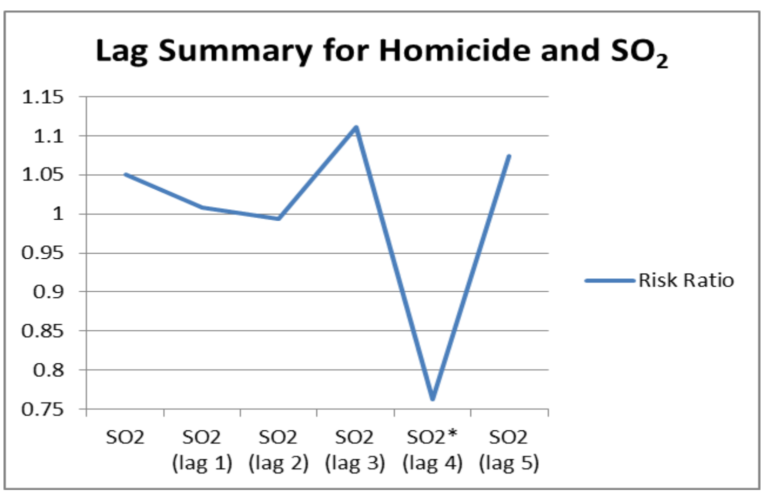
* Indicates statistical significance ($p \leq 0.05$)

Figure 16b: Lag Summary for Homicide and Carbon Monoxide (CO) for Houston



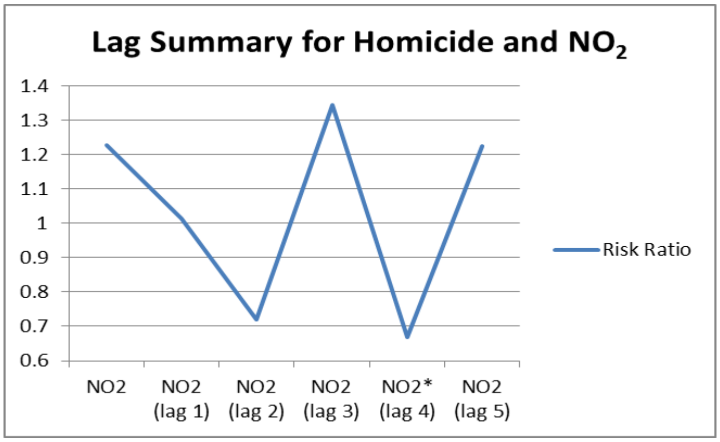
* Indicates statistical significance ($p \leq 0.05$)

Figure 16c: Lag Summary for Homicide and Sulfur Dioxide (SO_2) for Houston



* Indicates statistical significance ($p \leq 0.05$)

Figure 16d: Lag Summary for Homicide and Nitrogen Dioxide (NO_2) for Houston



* Indicates statistical significance ($p \leq 0.05$)

Figure 16e: Lag Summary for Motor Vehicle Theft and Nitrogen Dioxide (NO_2) for Houston

* Indicates statistical significance ($p \leq 0.05$)

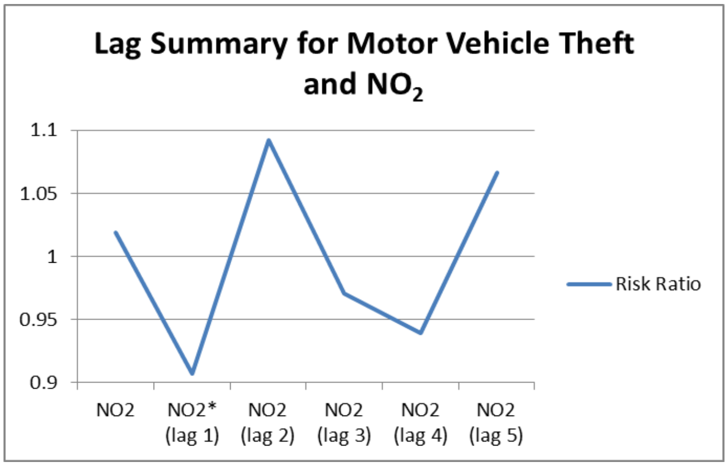


Figure 16f: Lag Summary for Motor Vehicle Theft and Coarse Particles (PM_{10}) for Houston

* Indicates statistical significance ($p \leq 0.05$)

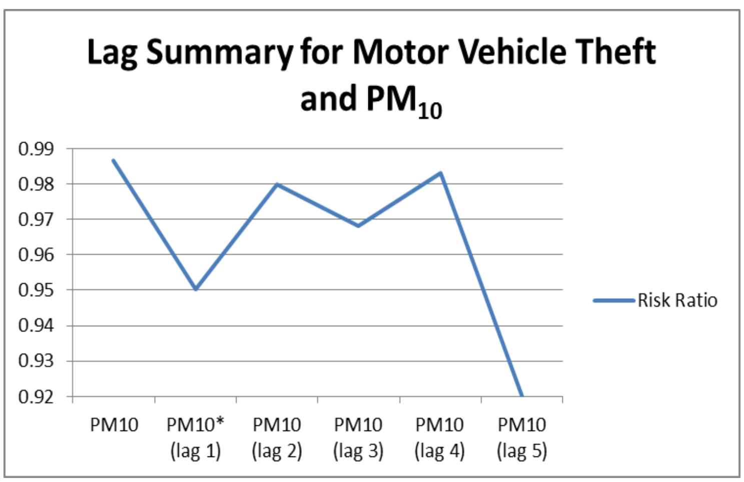
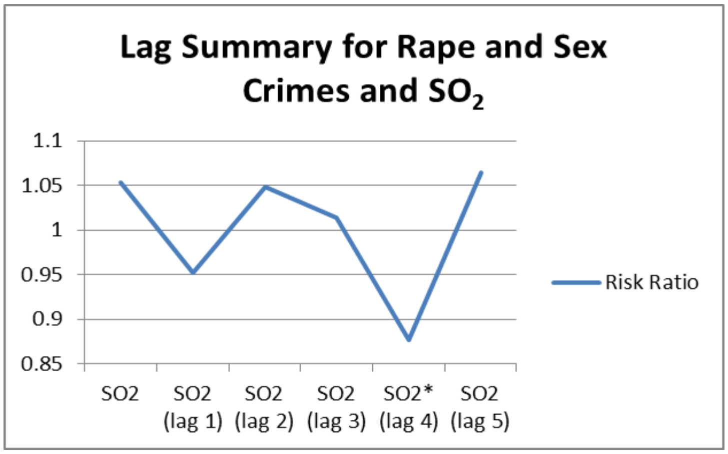
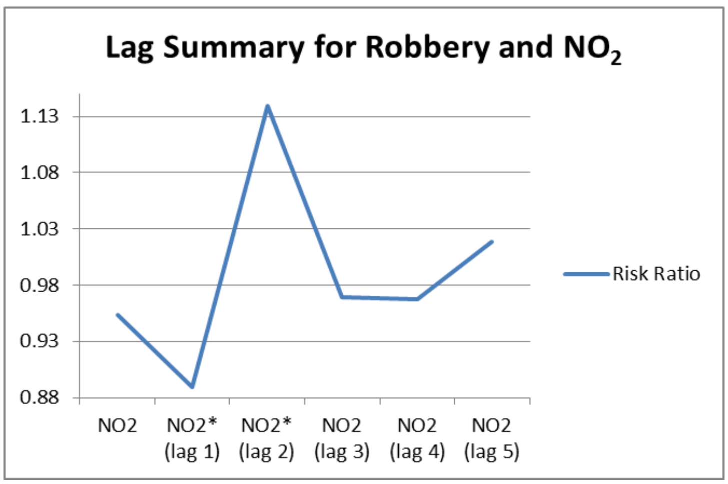


Figure 16g: Lag Summary for Rape and Sex Crimes and Sulfur Dioxide (SO_2) for Houston



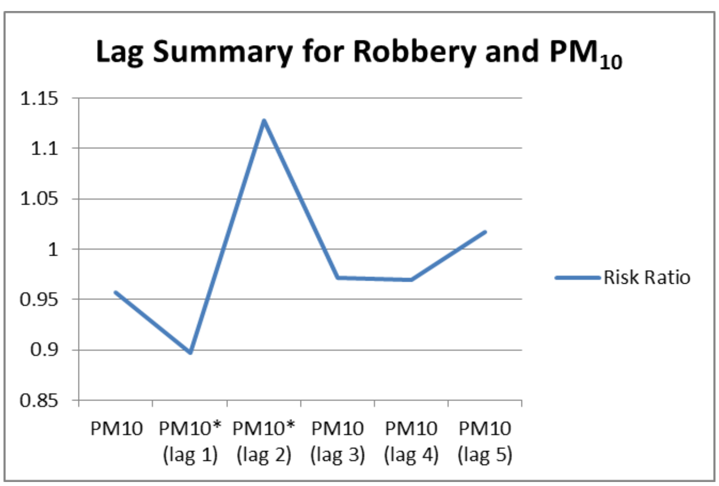
* Indicates statistical significance ($p \leq 0.05$)

Figure 16h: Lag Summary for Robbery and Nitrogen Dioxide (NO_2) for Houston



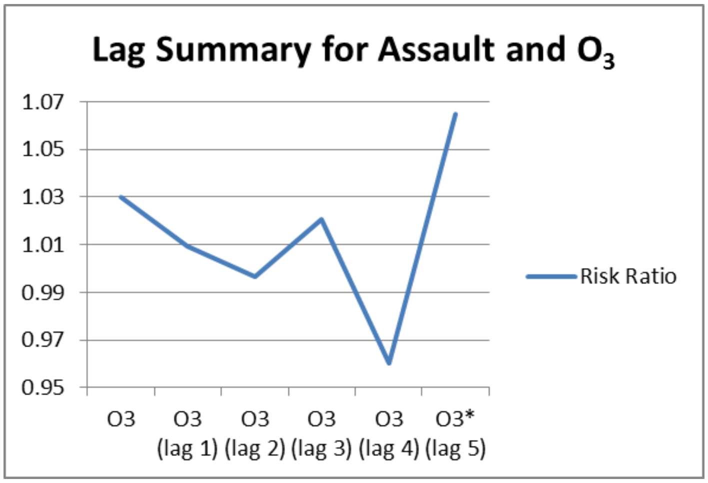
* Indicates statistical significance ($p \leq 0.05$)

Figure 16i: Lag Summary for Robbery and Coarse Particles (PM_{10}) for Houston



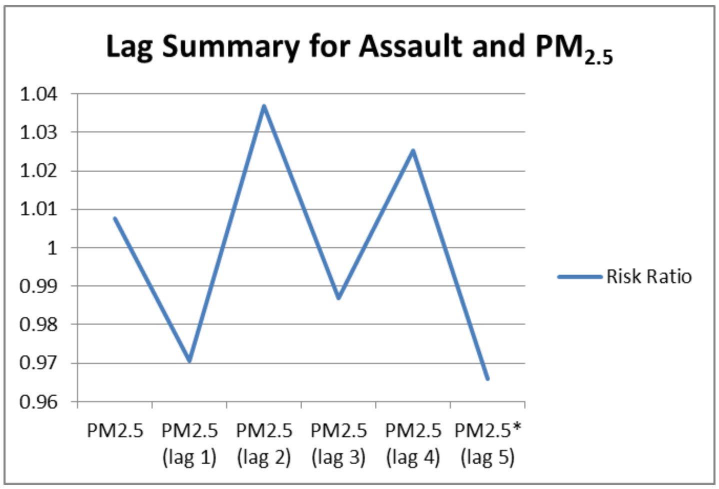
* Indicates statistical significance ($p \leq 0.05$)

Figure 17a: Lag Summary for Assault and Ozone (O_3) for Philadelphia



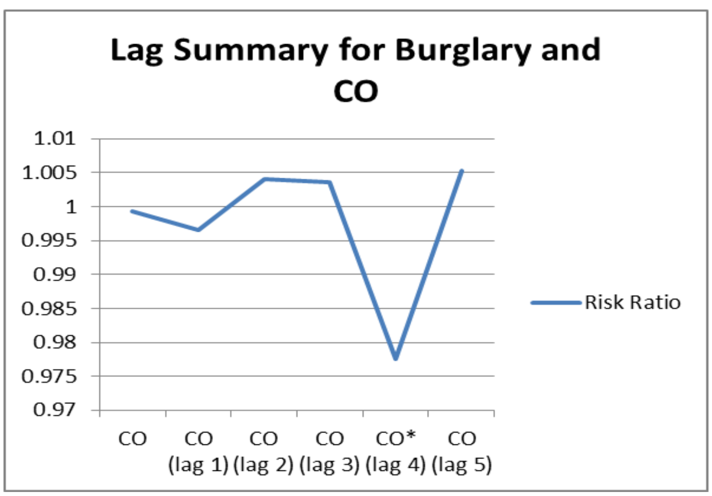
* Indicates statistical significance ($p \leq 0.05$)

Figure 17b: Lag Summary for Assault and Fine Particles ($PM_{2.5}$) for Philadelphia



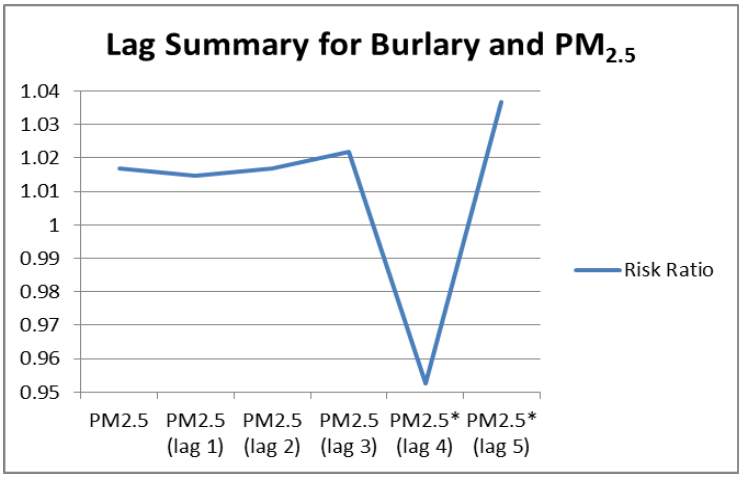
* Indicates statistical significance ($p \leq 0.05$)

Figure 17c: Lag Summary for Burglary and Carbon Monoxide (CO) for Philadelphia



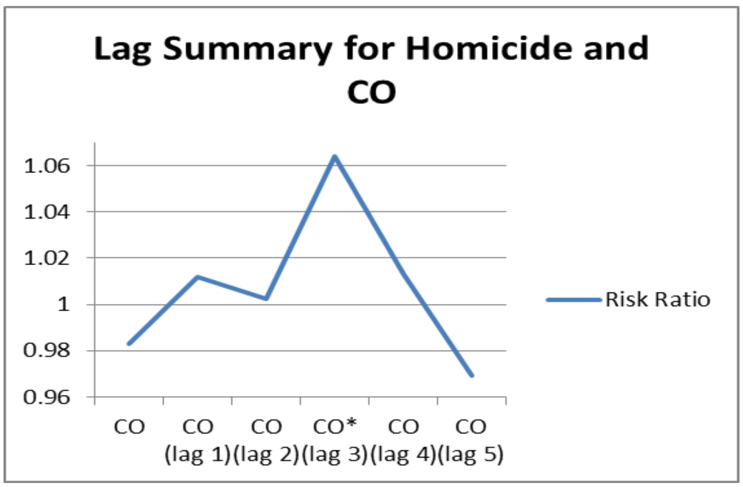
* Indicates statistical significance ($p \leq 0.05$)

Figure 17d: Lag Summary for Burglary and Fine Particles ($PM_{2.5}$) for Philadelphia



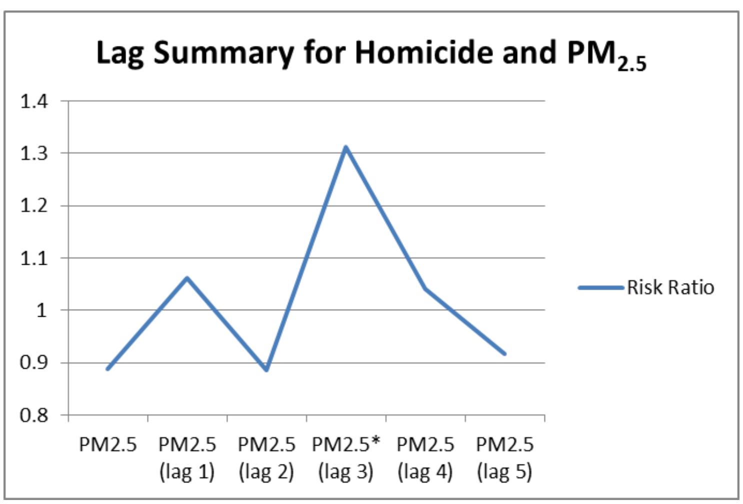
* Indicates statistical significance ($p \leq 0.05$)

Figure 17e: Lag Summary for Homicide and Carbon Monoxide (CO) for Philadelphia



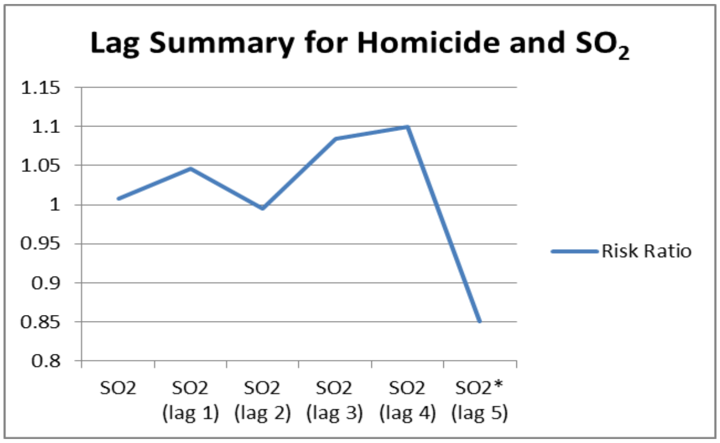
* Indicates statistical significance ($p \leq 0.05$)

Figure 17f: Lag Summary for Homicide and Fine Particles ($PM_{2.5}$) for Philadelphia



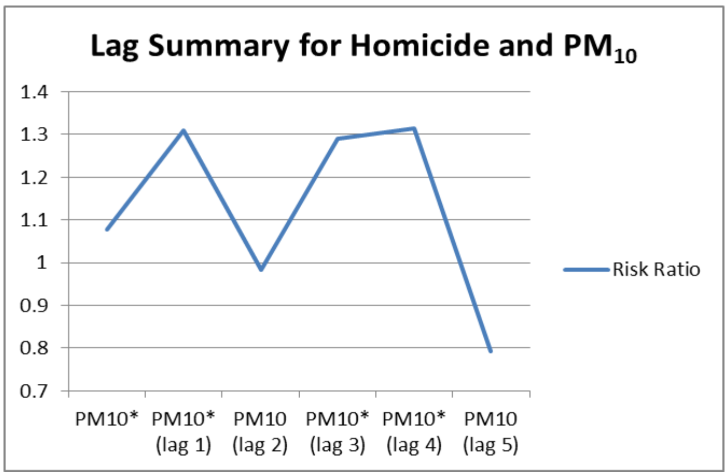
* Indicates statistical significance ($p \leq 0.05$)

Figure 17g: Lag Summary for Homicide and Sulfur Dioxide (SO_2) for Philadelphia



* Indicates statistical significance ($p \leq 0.05$)

Figure 17h: Lag Summary for Homicide and Coarse Particles (PM_{10}) for Philadelphia



* Indicates statistical significance ($p \leq 0.05$)

Figure 17i: Lag Summary for Motor Vehicle Theft and Carbon Monoxide (CO) for Philadelphia

* Indicates statistical significance ($p \leq 0.05$)

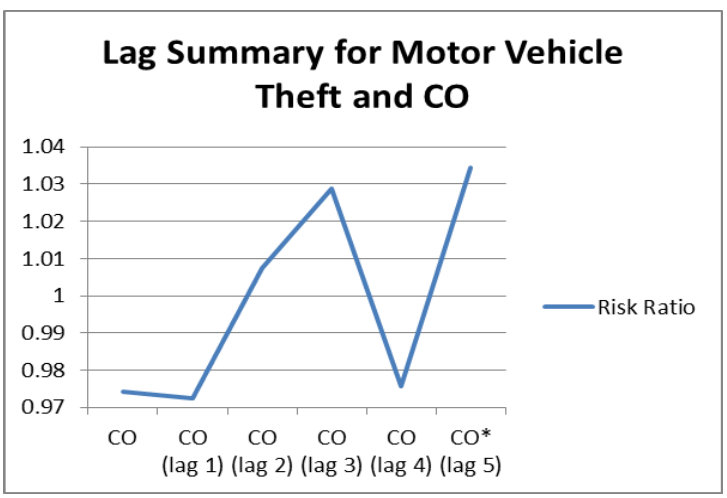
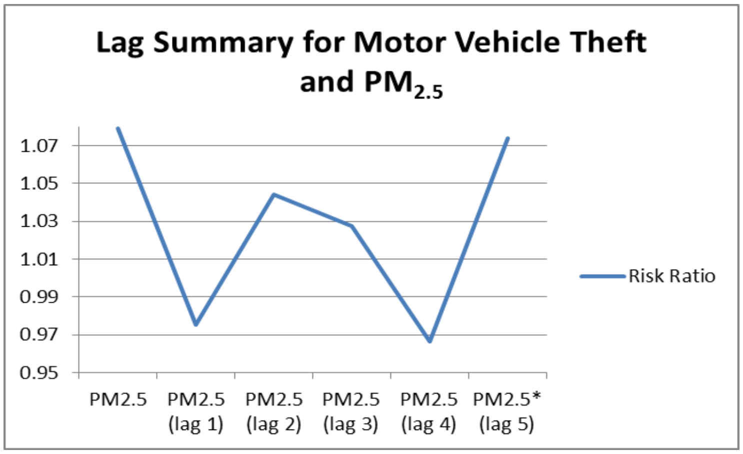
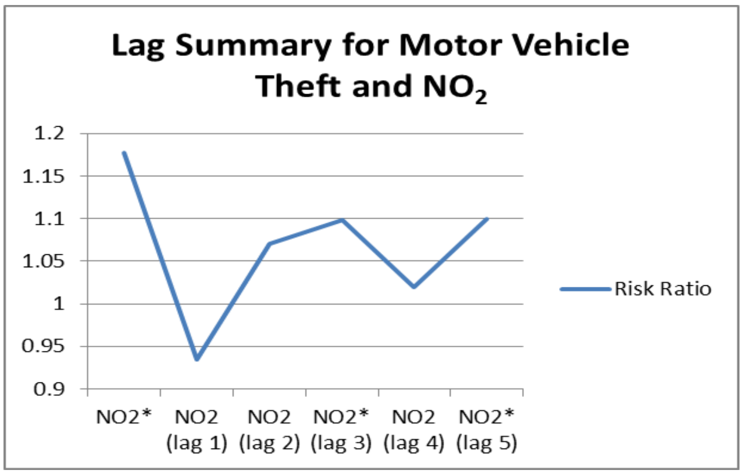


Figure 17j: Lag summary for Motor Vehicle Theft and Fine Particles ($PM_{2.5}$) for Philadelphia



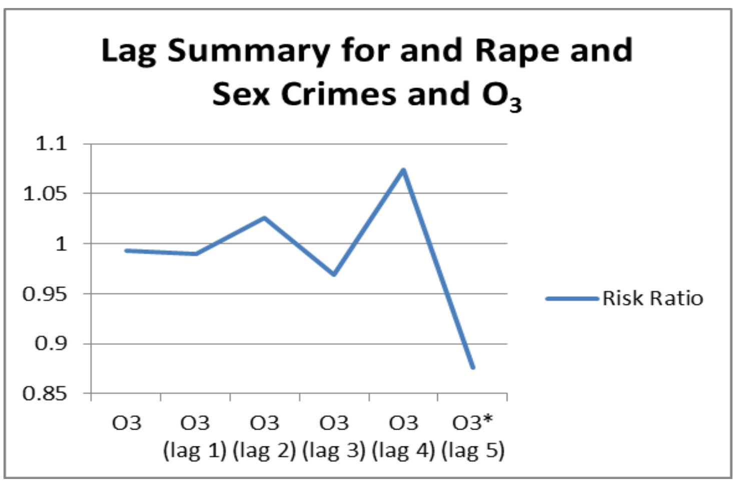
* Indicates statistical significance ($p \leq 0.05$)

Figure 17k: Lag Summary for Motor Vehicle Theft and Nitrogen Dioxide (NO_2) for Philadelphia



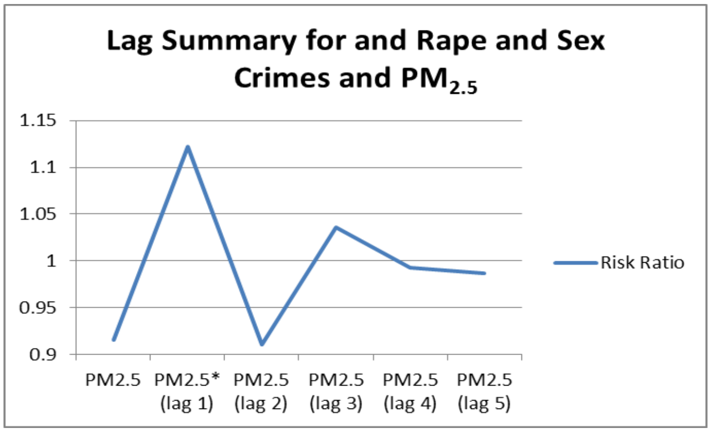
* Indicates statistical significance ($p \leq 0.05$)

Figure 17l: Lag Summary for Rape and Sex Crimes and Ozone (O_3) for Philadelphia



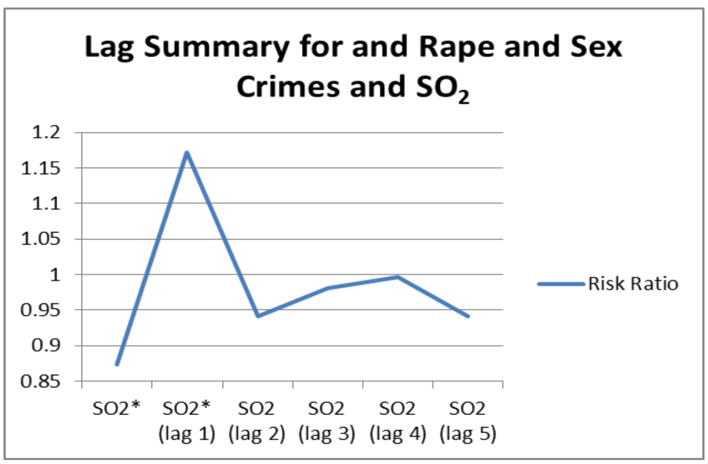
* Indicates statistical significance ($p \leq 0.05$)

Figure 17m: Lag Summary for Rape and Sex Crimes and Fine Particles ($PM_{2.5}$) for Philadelphia



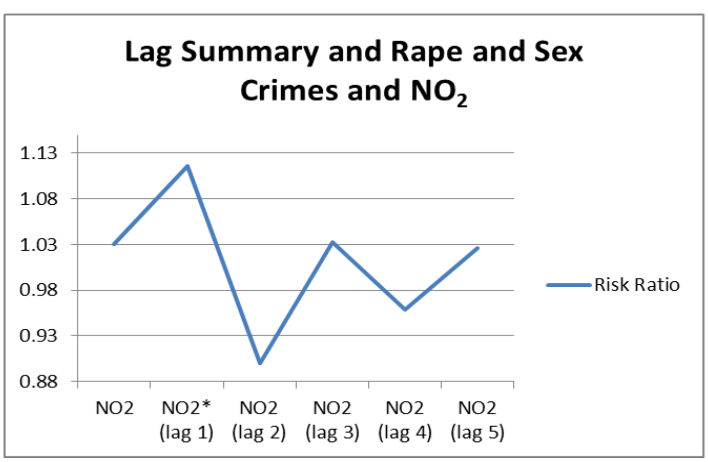
* Indicates statistical significance ($p \leq 0.05$)

Figure 17n: Lag Summary for Rape and Sex Crimes and Sulfur Dioxide (SO_2) for Philadelphia



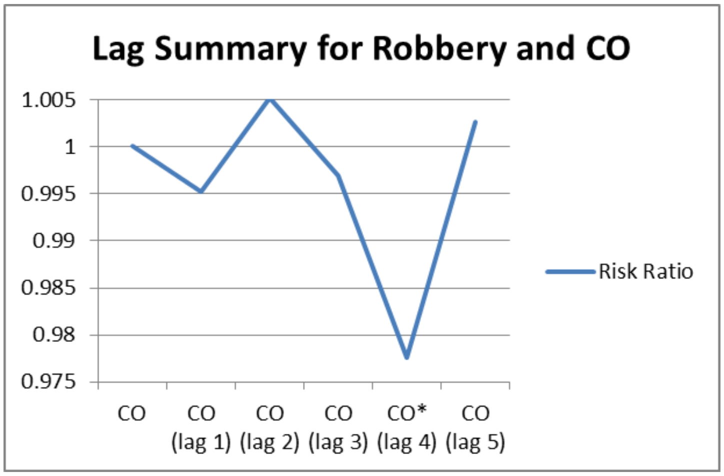
* Indicates statistical significance ($p \leq 0.05$)

Figure 17o: Lag Summary for Rape and Sex Crimes and Nitrogen Dioxide (NO_2) for Philadelphia



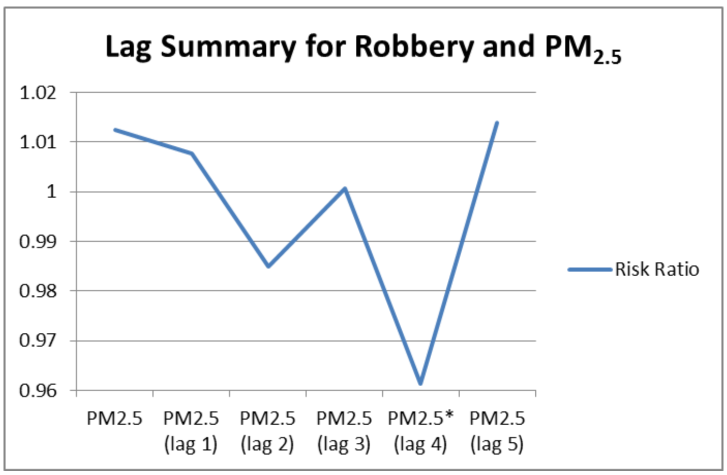
* Indicates statistical significance ($p \leq 0.05$)

Figure 17p: Lag Summary for Robbery and Carbon Monoxide (CO) for Philadelphia



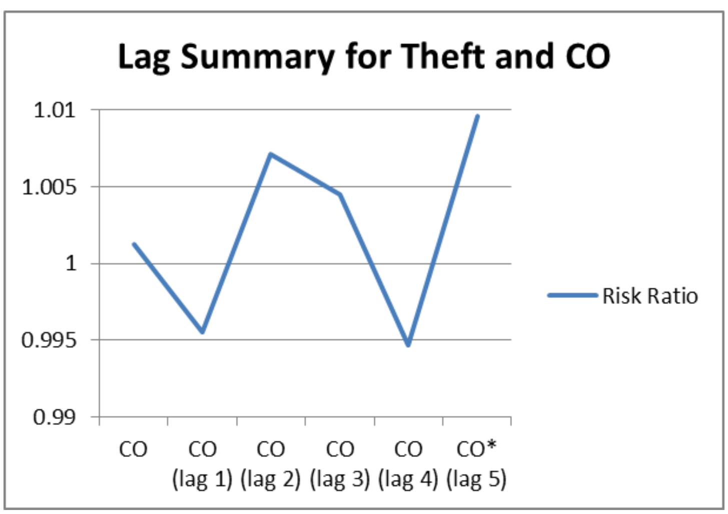
* Indicates statistical significance (p≤0.05)

Figure 17q: Lag Summary for Robbery and Fine Particles ($PM_{2.5}$) for Philadelphia



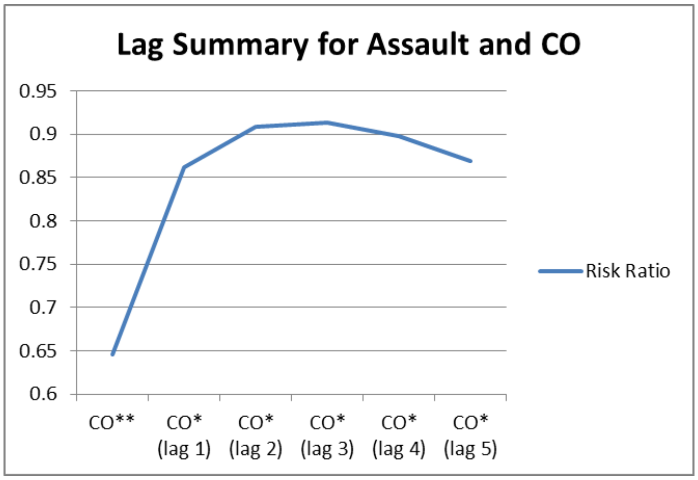
* Indicates statistical significance (p≤0.05)

Figure 17r: Lag Summary for Theft and Carbon Monoxide (CO) for Philadelphia



* Indicates statistical significance (p≤0.05)

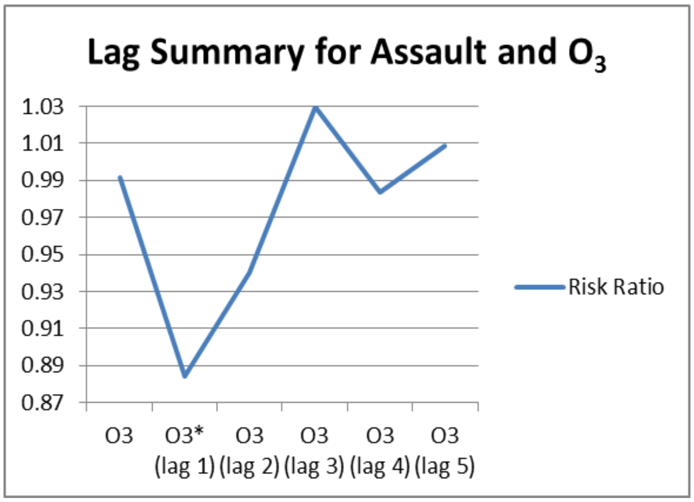
Figure 18a: Lag Summary for Assault and Carbon Monoxide (CO) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

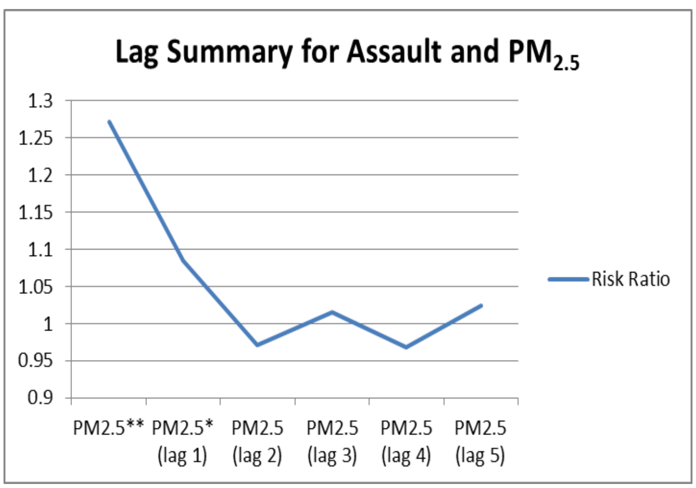
**Indicates statistical significance ($p < 0.0001$)

Figure 18b: Lag Summary for Assault and Ozone (O_3) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

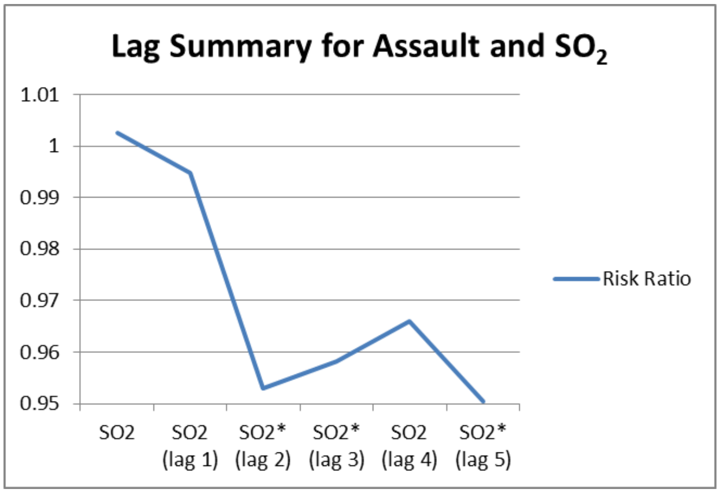
Figure 18c: Lag Summary for Assault and Fine Particles ($PM_{2.5}$) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

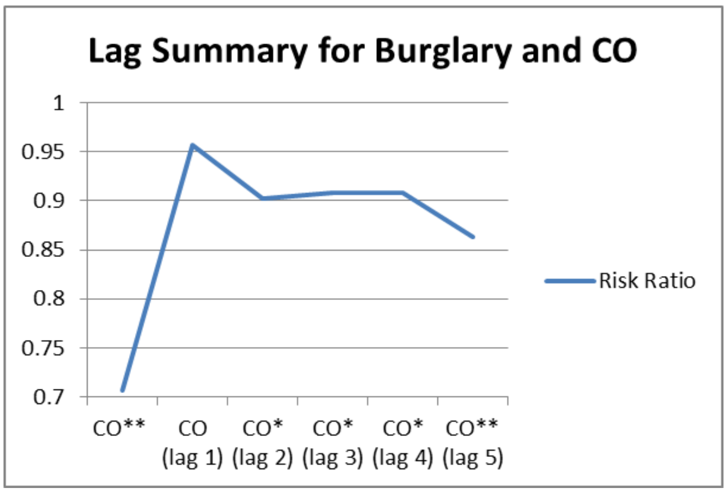
**Indicates statistical significance ($p < 0.0001$)

Figure 18d: Lag Summary for Assault and Sulfur Dioxide (SO_2) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

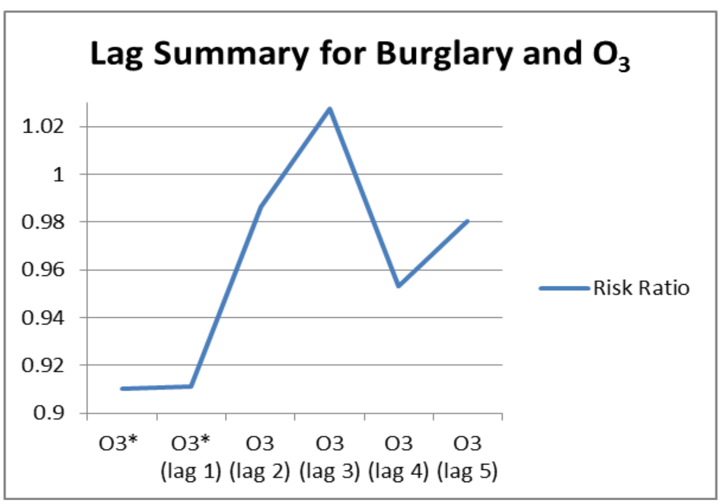
Figure 18e: Lag Summary for Burglary and Carbon Monoxide (CO) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

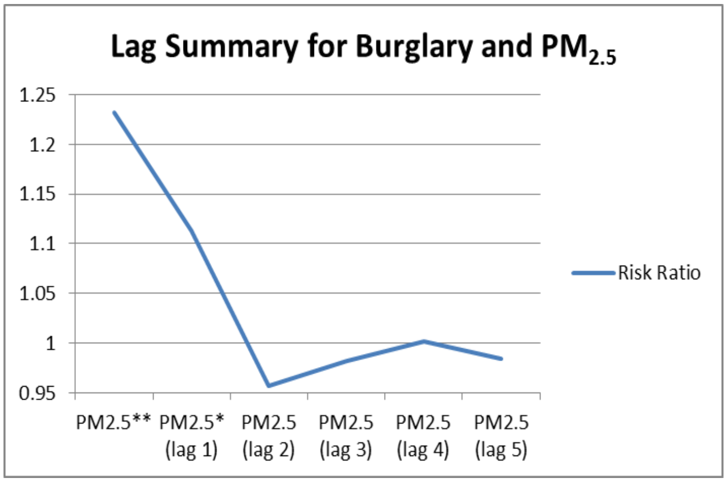
**Indicates statistical significance ($p < 0.0001$)

Figure 18f: Lag Summary for Burglary and Ozone (O_3) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

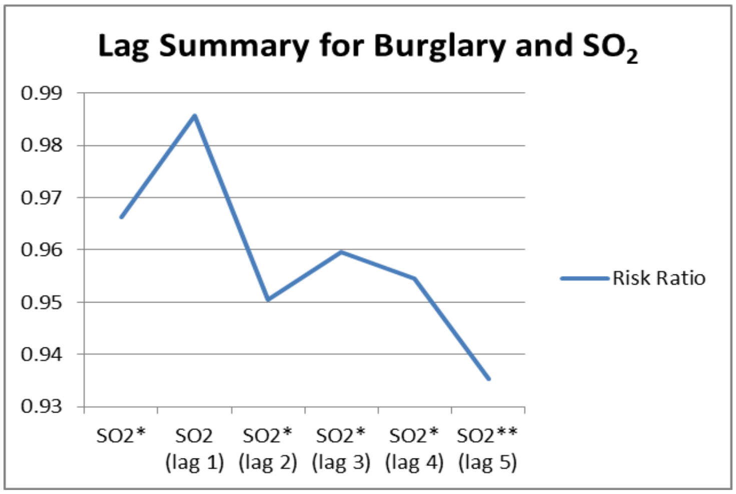
Figure 18g: Lag Summary for Burglary and Fine Particles ($PM_{2.5}$) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

**Indicates statistical significance ($p < 0.0001$)

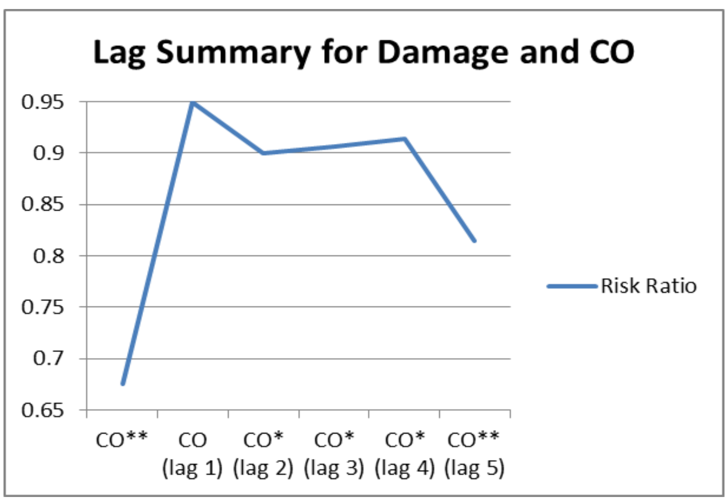
Figure 18h: Lag Summary for Burglary and Sulfur Dioxide (SO_2) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

**Indicates statistical significance ($p < 0.0001$)

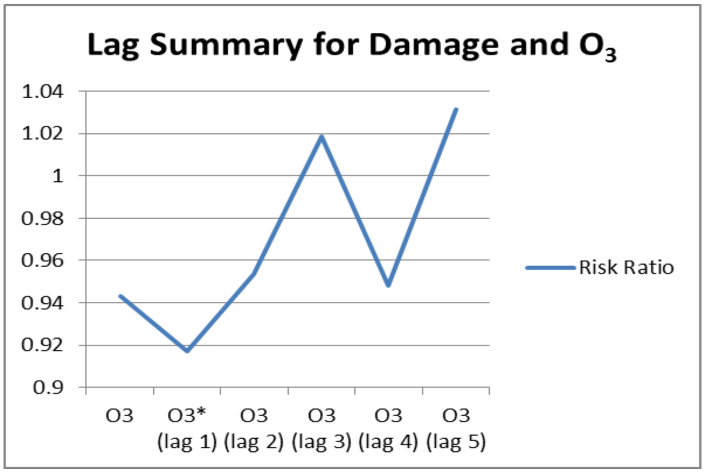
Figure 18i: Lag Summary for Damage and Carbon Monoxide (CO) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

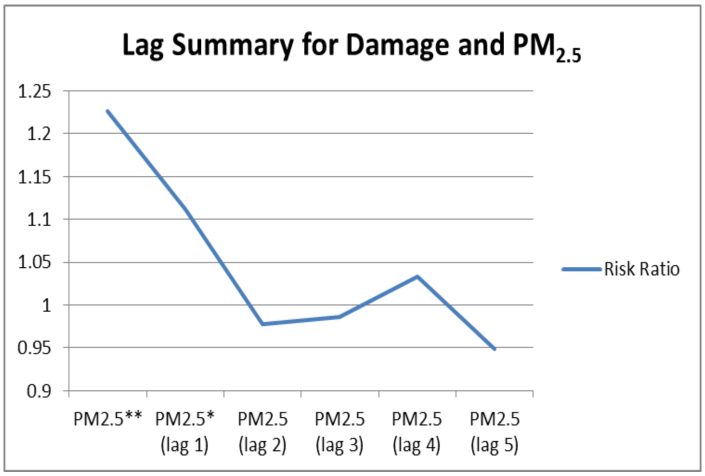
**Indicates statistical significance ($p < 0.0001$)

Figure 18j: Lag Summary for Damage and Ozone (O_3) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

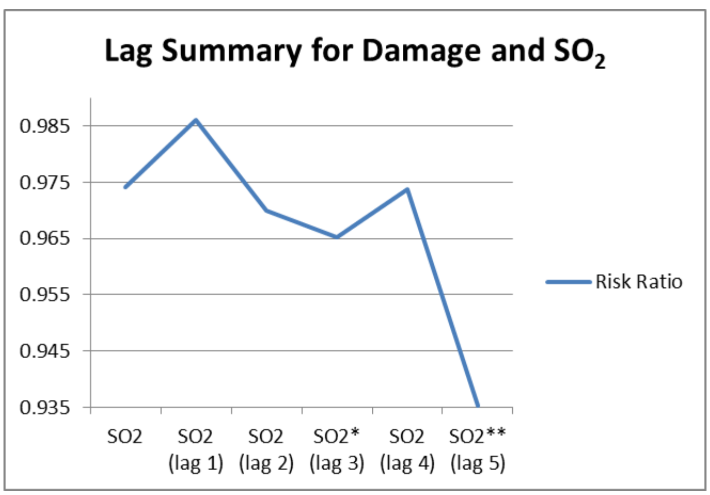
Figure 18k: Lag Summary for Damage and Fine Particles ($PM_{2.5}$) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

**Indicates statistical significance ($p < 0.0001$)

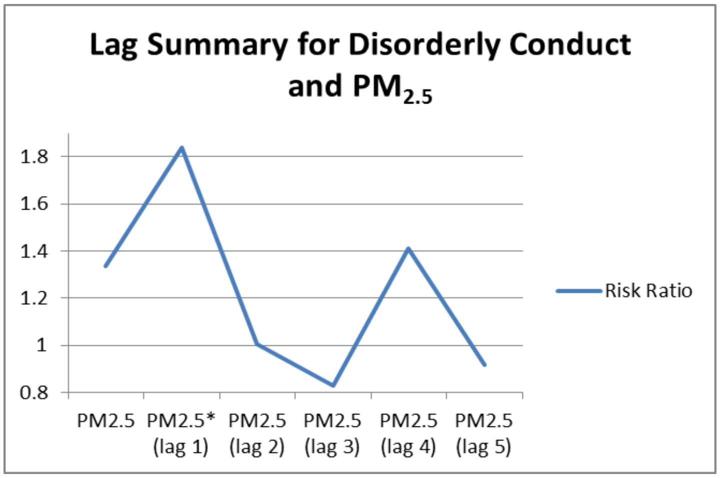
Figure 18l: Lag Summary for Damage and Sulfur Dioxide (SO_2) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

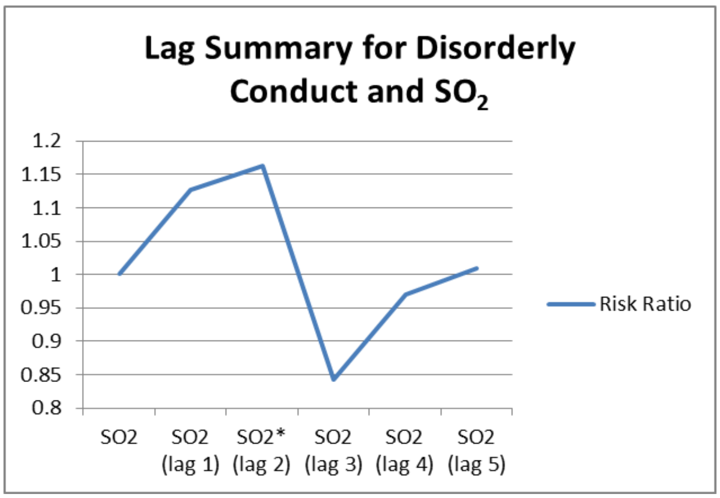
**Indicates statistical significance ($p < 0.0001$)

Figure 18m: Lag Dummary for Disorderly Conduct and Fine Particles ($PM_{2.5}$) for Seattle



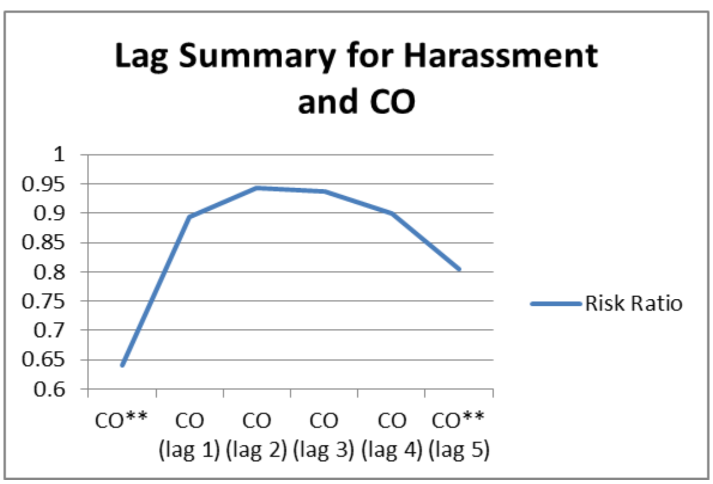
* Indicates statistical significance ($p \leq 0.05$)

Figure 18n: Lag Summary for Disorderly Conduct and Sulfur Dioxide (SO_2) for Seattle



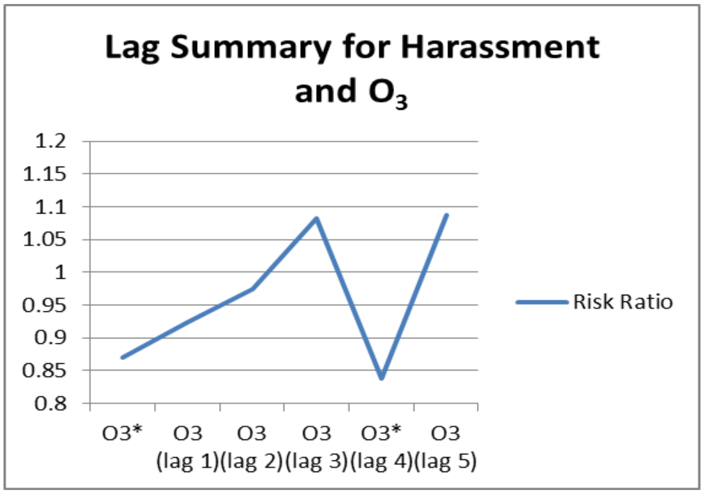
* Indicates statistical significance ($p \leq 0.05$)

Figure 18o: Lag Summary for Harassment and Carbon Monoxide (CO) for Seattle



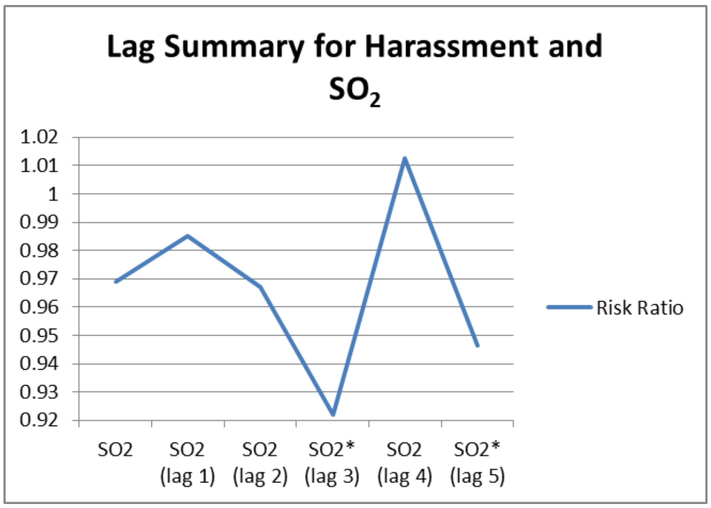
**Indicates statistical significance ($p < 0.0001$)

Figure 18p: Lag Summary for Harassment and Ozone (O_3) for Seattle



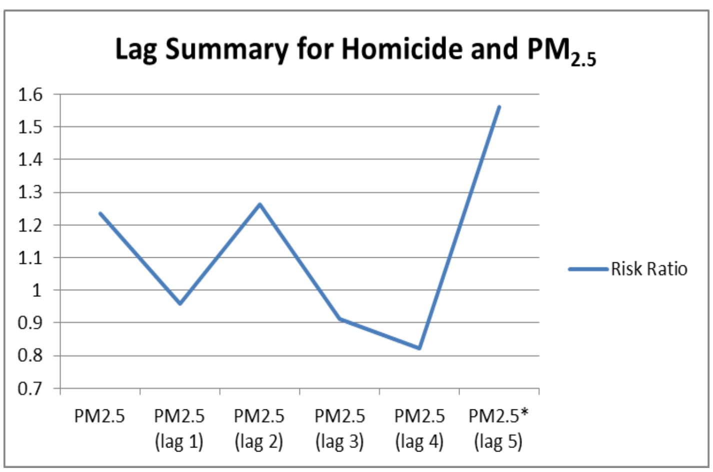
* Indicates statistical significance ($p \leq 0.05$)

Figure 18q: Lag Summary for Harassment and Sulfur Dioxide (SO_2) for Seattle



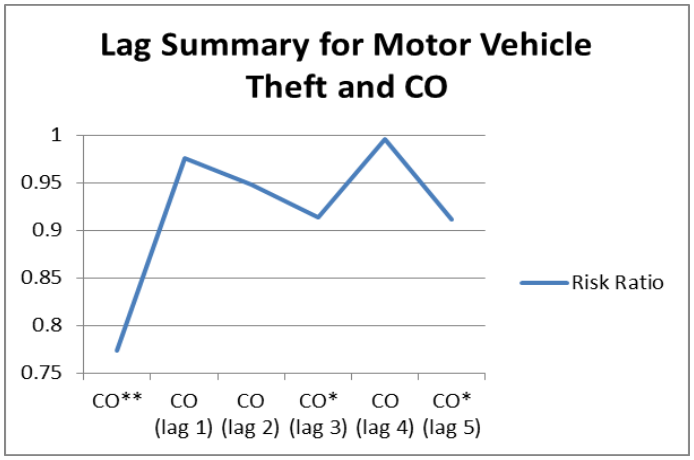
* Indicates statistical significance ($p \leq 0.05$)

Figure 18r: Lag Summary for Homicide and Fine Particles ($PM_{2.5}$) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

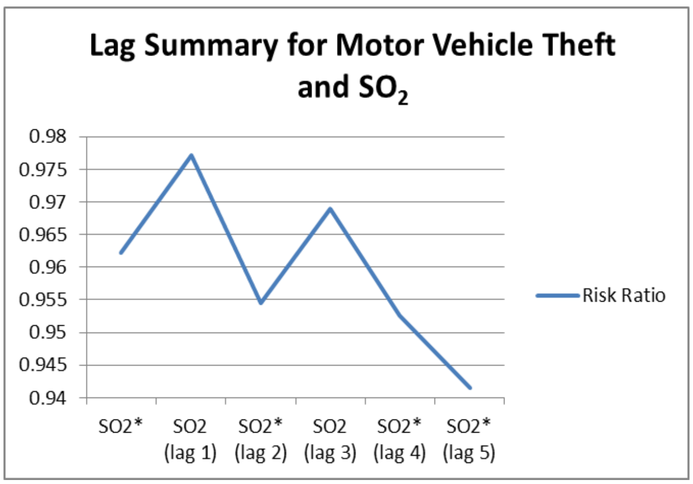
Figure 18s: Lag Summary for Motor Vehicle Theft and Carbon Monoxide (CO) for Seattle



* Indicates statistical significance (p≤0.05)

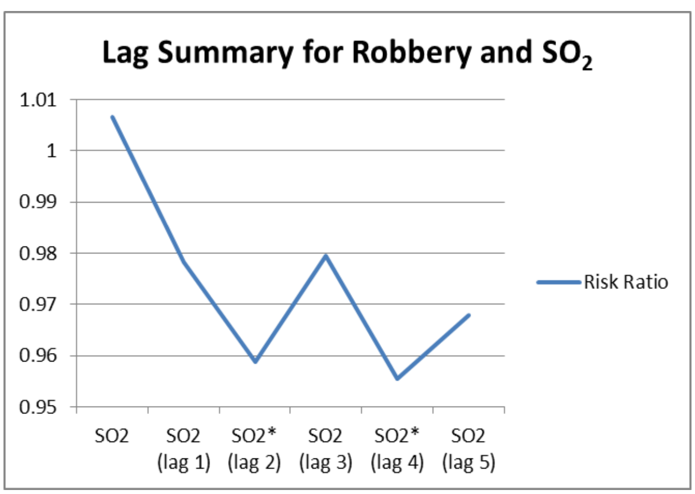
**Indicates statistical significance (p<0.0001)

Figure 18t: Lag Summary for Motor Vehicle Theft and Sulfur Dioxide (SO_2) for Seattle



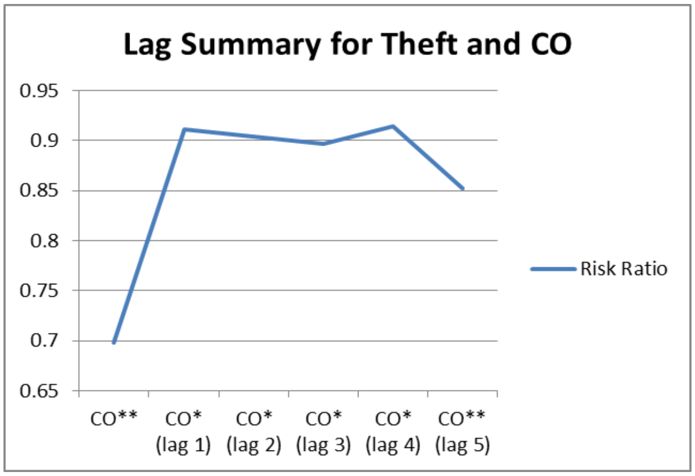
* Indicates statistical significance (p≤0.05)

Figure 18u: Lag Summary for Robbery and Sulfur Dioxide (SO_2) for Seattle



* Indicates statistical significance (p≤0.05)

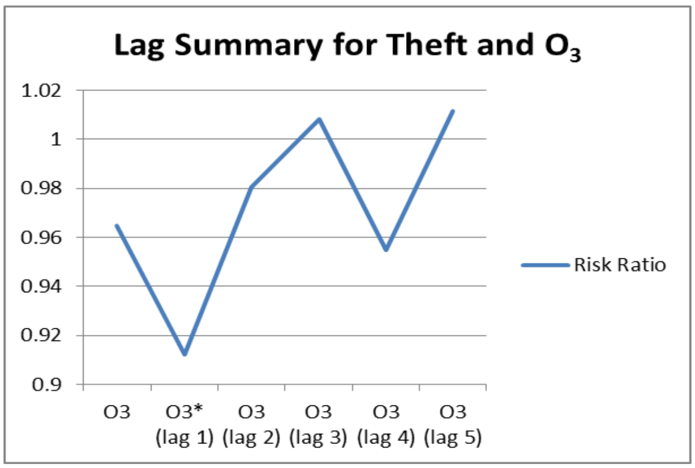
Figure 18v: Lag Summary for Theft and Carbon Monoxide (CO) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

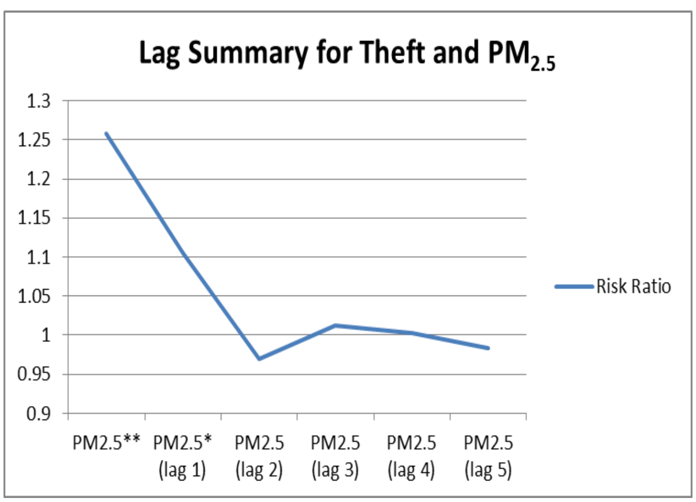
**Indicates statistical significance ($p < 0.0001$)

Figure 18w: Lag Summary for Theft and Ozone (O_3) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

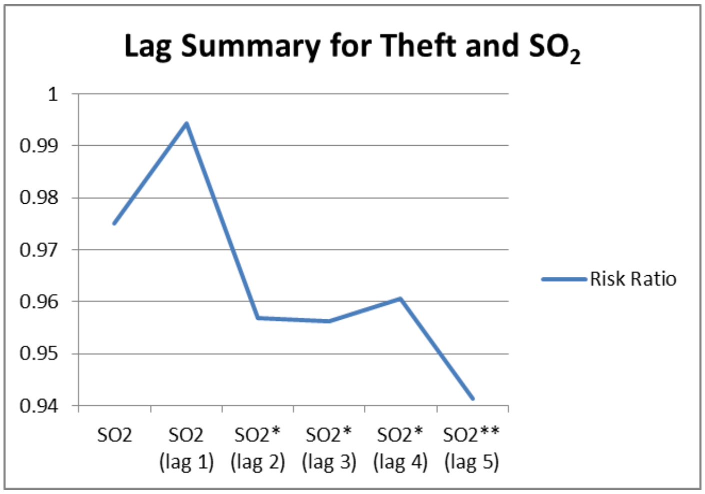
Figure 18x: Lag Summary for Theft and Fine Particles ($PM_{2.5}$) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

**Indicates statistical significance ($p < 0.0001$)

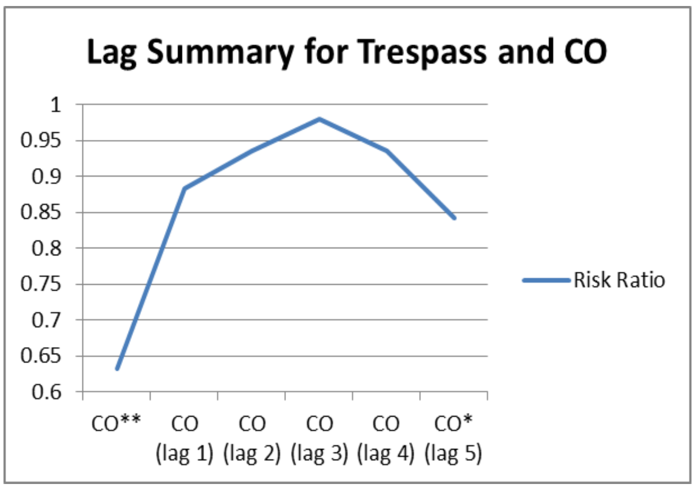
Figure 18y: Lag Summary for Theft and Sulfur Dioxide (SO_2) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

**Indicates statistical significance ($p < 0.0001$)

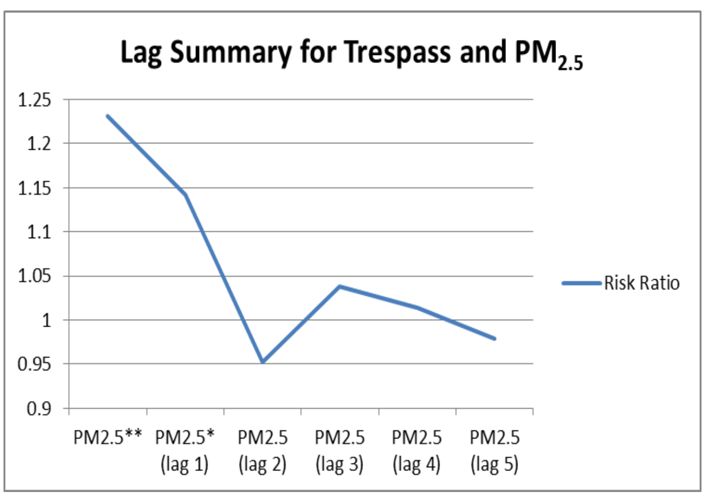
Figure 18z: Lag Summary for Trespass and Carbon Monoxide (CO) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

**Indicates statistical significance ($p < 0.0001$)

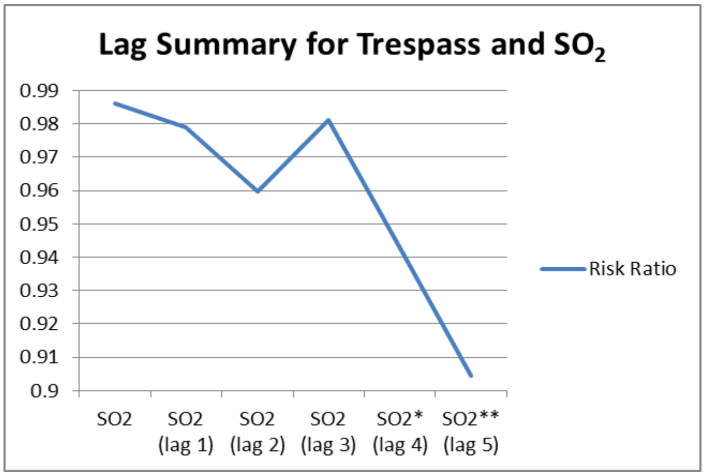
Figure 18aa: Lag Summary for Trespass and Fine Particles ($PM_{2.5}$) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

**Indicates statistical significance ($p < 0.0001$)

Figure 18ab: Lag Summary for Trespass and Sulfur Dioxide (SO_2) for Seattle



* Indicates statistical significance ($p \leq 0.05$)

**Indicates statistical significance ($p < 0.0001$)

The Exposure Factors Handbook (EPA, 2011) was used to determine how many hours the population for each city spent completing different activities. Table 40 shows the results based on the age distribution of the population considering those aged 15 years and up and using the age categories presented in Table 2. Based on the population, the majority of people's time is spent indoors. These additional factors were considered as mapping attributes, but it was unclear if they had an effect on overall crimes by location. Due to the number of built environment factors, each city would need to be assessed by block to determine if crime hot spots were near a specific activity, and if so, did the particular activity have a similar result elsewhere in the city or just in that one location.

Table 41 shows that about 76% of time was spent indoors, 7% in-vehicle and 18% outdoors. Though some sub-categories were included to help define time spent in different microenvironments, the categories are not all-inclusive and therefore, do not add to 100%. For indoor settings, the summary included high level categories like time in residence, educational activities, time spent purchasing goods and services and work related activities. The outdoor summary focused on near roadway activities, like waiting for a bus, along with other activities like walking outdoors and sports, exercise and outdoor recreation. Due to the many other activities that potentially occurring outdoors, future studies should isolate city specific activities by block to include parks and built environment makeuprecreational features like grass, dirt and sand/gravel.

Table 41: Estimated Hours per Day by Age Range and Location

	Chicago	Houston	Philadelphia	Seattle	All Locations	% of Hours/Day
	Hours / Day					
Time Indoors (total)	**42,513,825**	**32,454,750**	**24,242,781**	**10,471,172**	**109,682,528**	**75.9%**
Time in Residence	35,383,902	26,929,796	20,253,977	8,761,715	91,329,391	83%
Educational Activity	1,079,647	832,733	642,452	223,169	2,778,001	3%
Purchasing Goods and Services	1,772,082	1,351,543	1,005,919	441,771	4,571,316	4%
Work Related Activity	8,477,403	6,536,434	4,670,997	2,132,132	21,816,967	20%
Time In-Vehicle (total)	**3,678,560**	**2,811,722**	**2,086,615**	**910,733**	**9,487,630**	**6.6%**
Time in Motor Vehicle (heavy traffic)	901,696	686,088	514,465	225,400	2,327,649	25%
Time Outdoors (total)	**9,817,762**	**7,479,400**	**5,578,401**	**2,465,300**	**25,340,863**	**17.5%**
Near Roadway Activity (heavy traffic)	736,725	563,553	420,092	181,116	1,901,487	8%
Sports, Exercise, Recreation	570,218	435,174	325,103	140,741	1,471,237	6%
Running or Walking Outdoors	1,186,071	906,528	680,644	285,708	3,058,950	12%
Total Hours Per Day	**56,010,147**	**42,745,872**	**31,907,797**	**13,847,205**	**144,511,021**	**100%**

(American Community Survey, 2009-2013; Exposure Factors Handbook, Chapter 16 Activity Factors)

The maps in Figures 19 through 22 depict potential hot spots for each crime type in relation to local emission sources of outdoor air pollution, including the criteria pollutant subject to federal regulation focused upon in the present study. These include but are not limited to industrial buildings, gas stations, main roadways and power plants. When reviewing maps created for Chicago (Figures 19a-j), many crime types were widespread throughout the city and did not appear to have occurred in larger numbers near emission sources. Similarly, in Houston (Figures 20a-g), some U.S. Census blocks had increased numbers of crime; however, when looking at the placement of the local emission sources on the maps, the crimes seem to be dispersed throughout Houston instead of in areas surrounding multiple emission sources. Figures 21a through 21e pertain to Philadelphia. Like the other locations, the number of crimes occurring within Philadelphia at points directly next to each other made it hard to see what the roadways and area may look like near the crime because a majority of the map is covered with data points. In Seattle (Figures 22a-k), the center of the city has the highest concentration of crime. This was different than in the other study cities. Since Seattle also had fewer observable hot spots, it is easier to see how the hot spots are occurring next to or at the same point as emission sources for assault, disorderly conduct, motor vehicle theft, robbery, and trespass crimes.

Figure 19a: Chicago Arson and Reckless Burning Crimes and Local Emitters

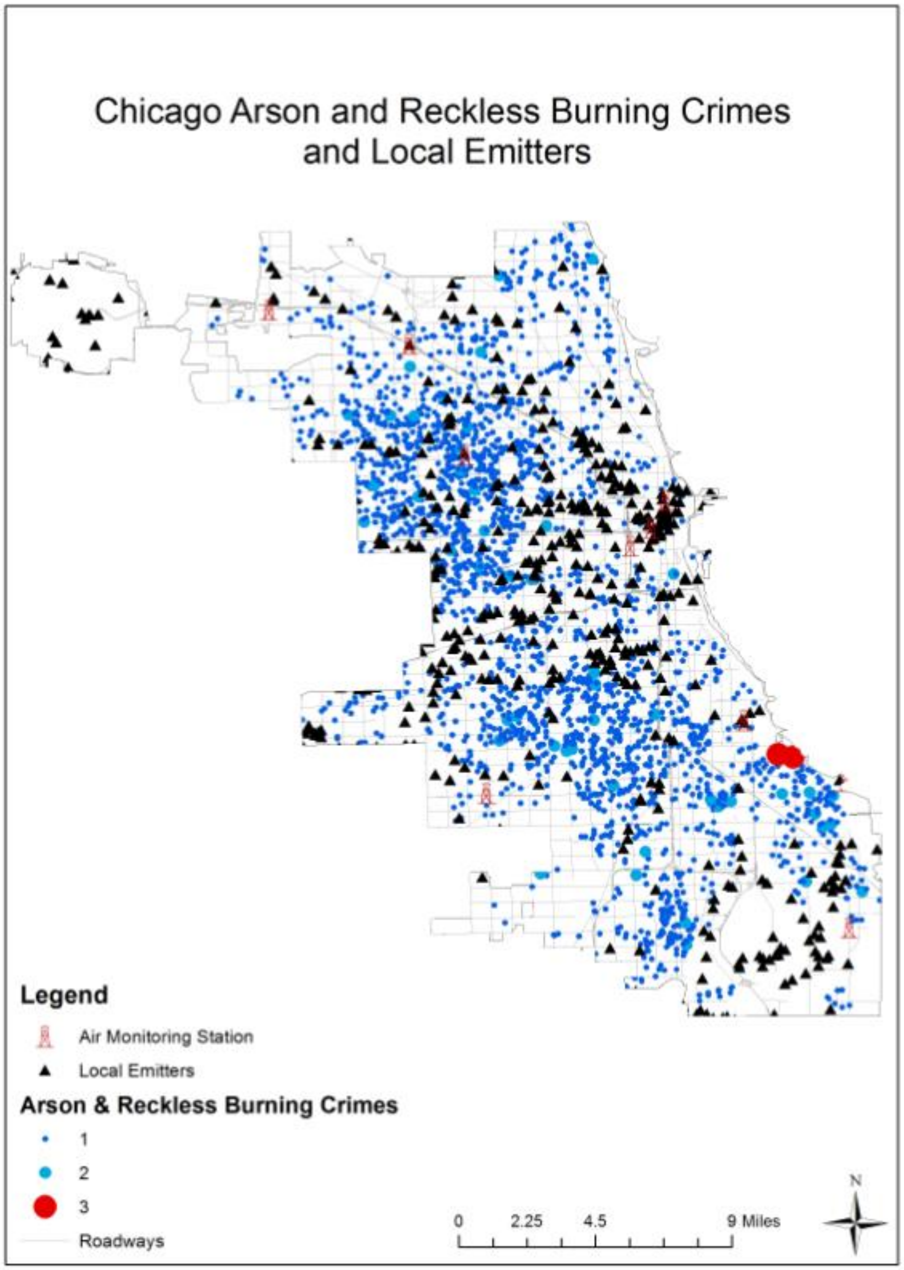


Figure 19b: Chicago Assault Crimes and Local Emitters

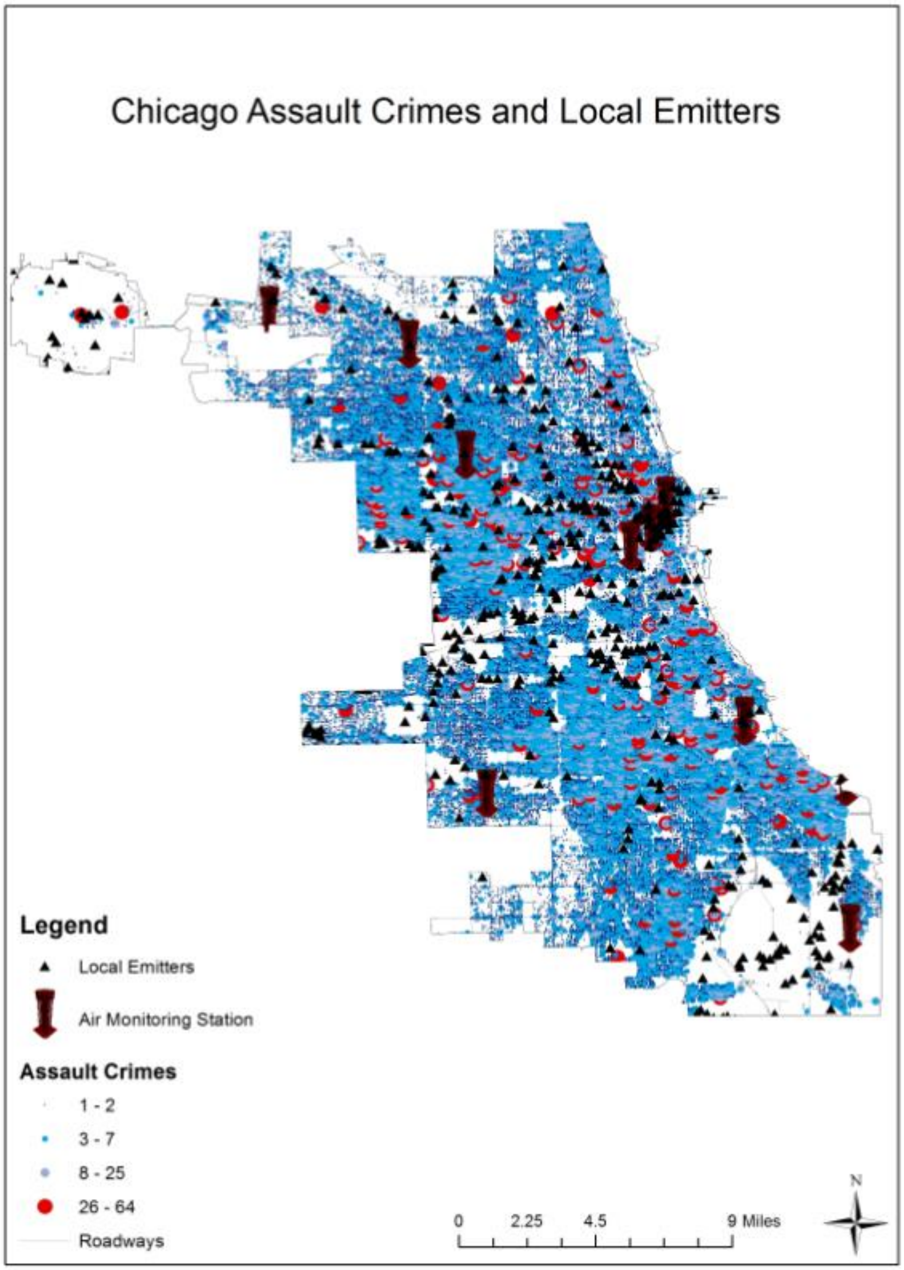


Figure 19c: Chicago Burglary Crimes and Local Emitters

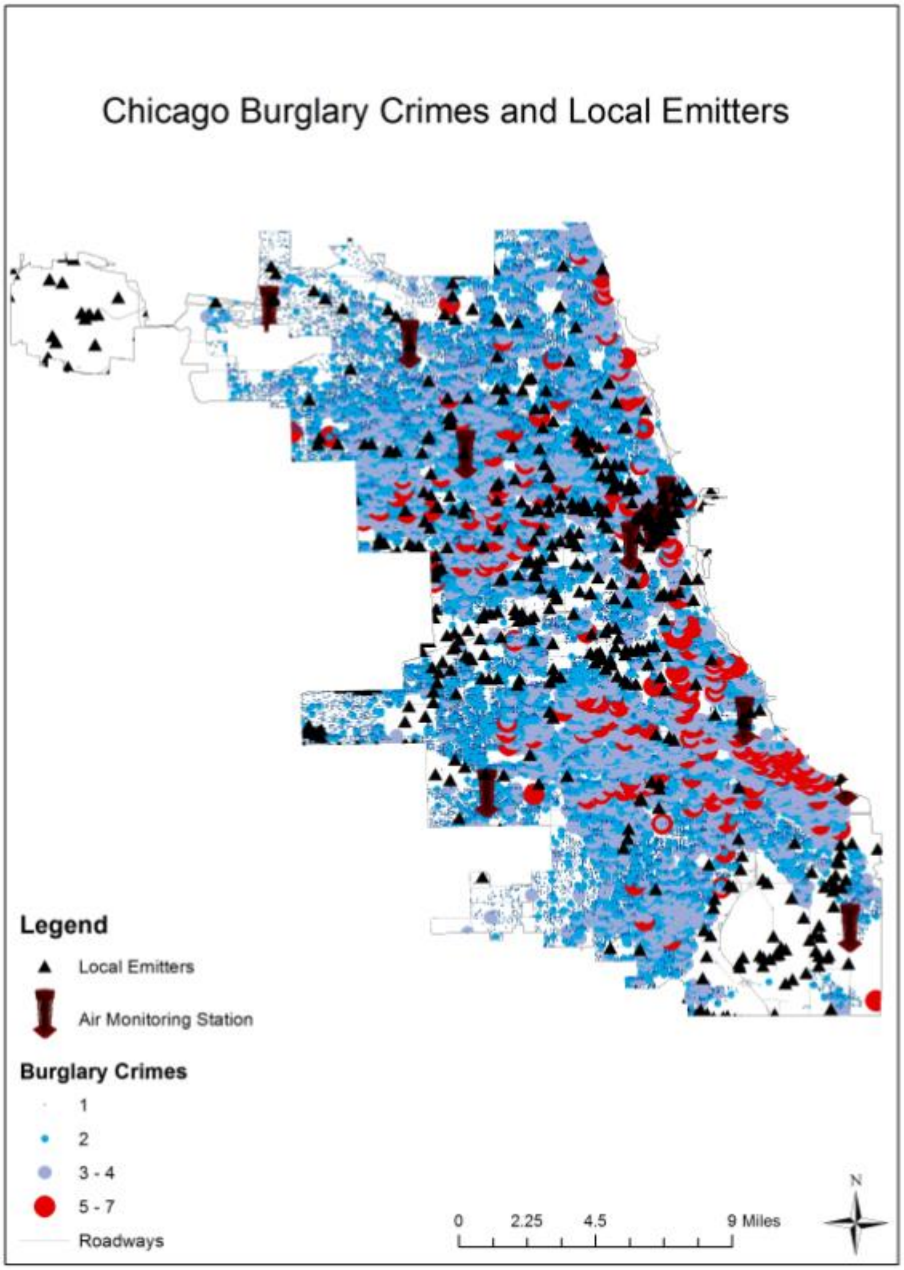


Figure 19c: Chicago Damage Crimes and Local Emitters

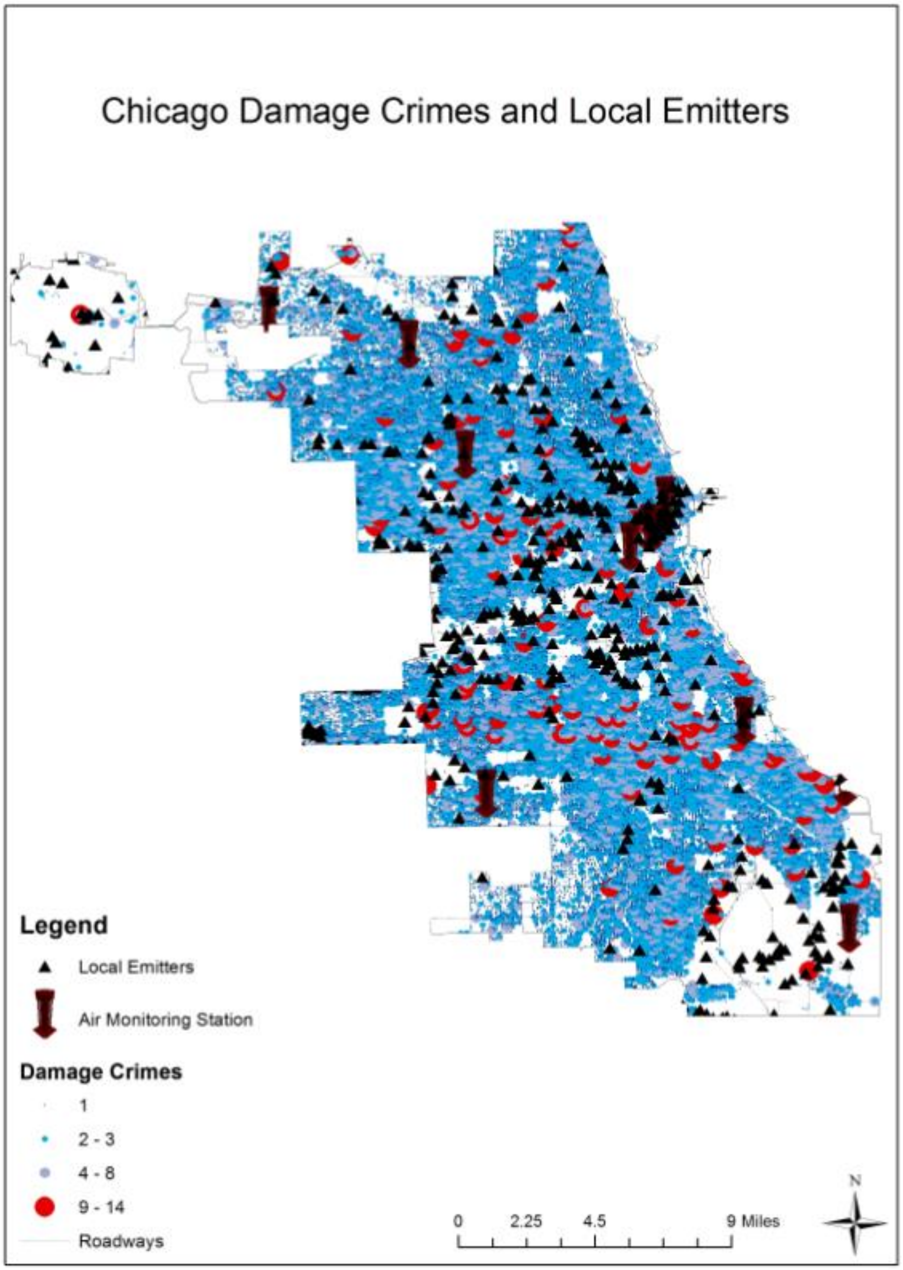


Figure 19d: Chicago Homicide Crimes and Local Emitters

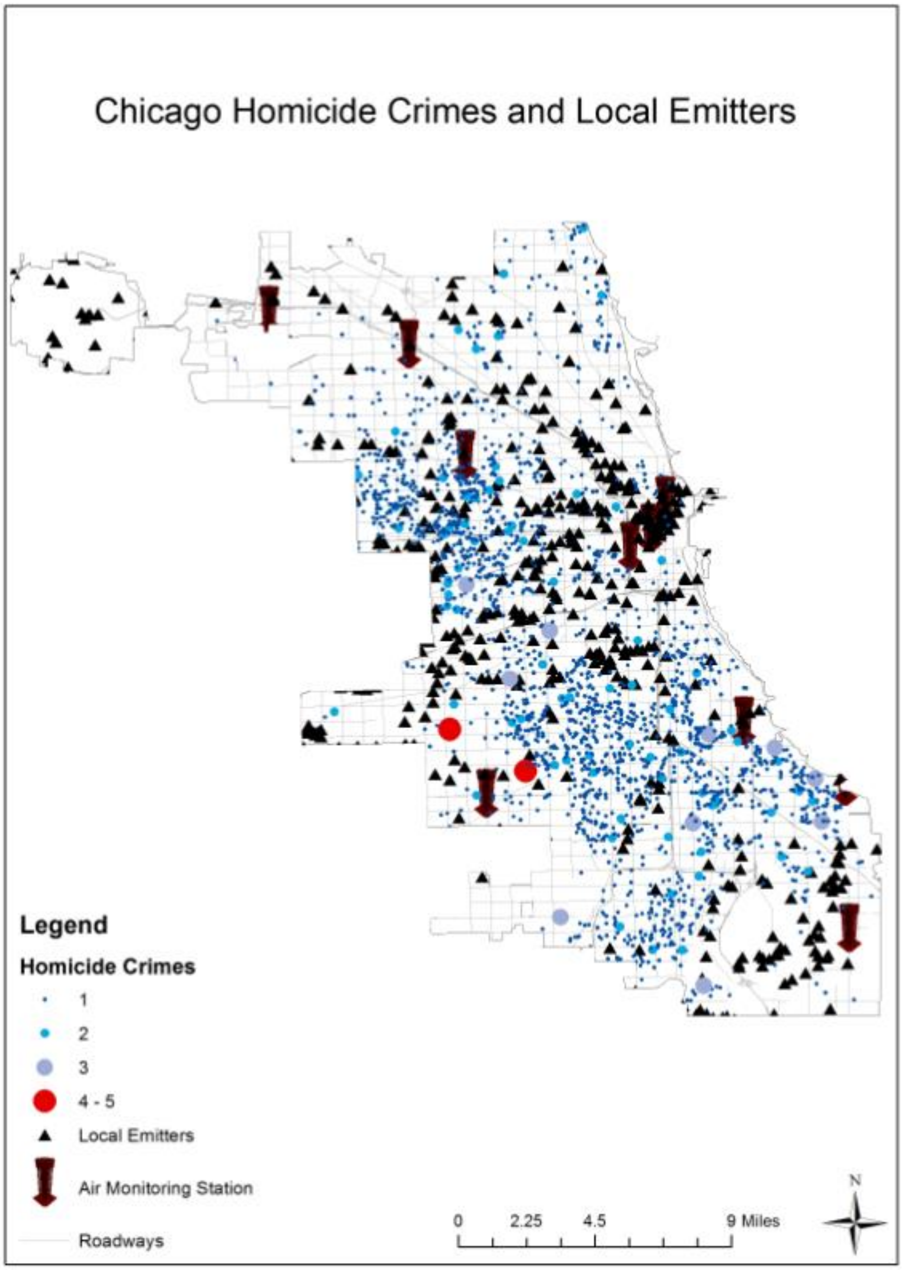


Figure 19e: Chicago Interference with a Public Officer and Local Emitters

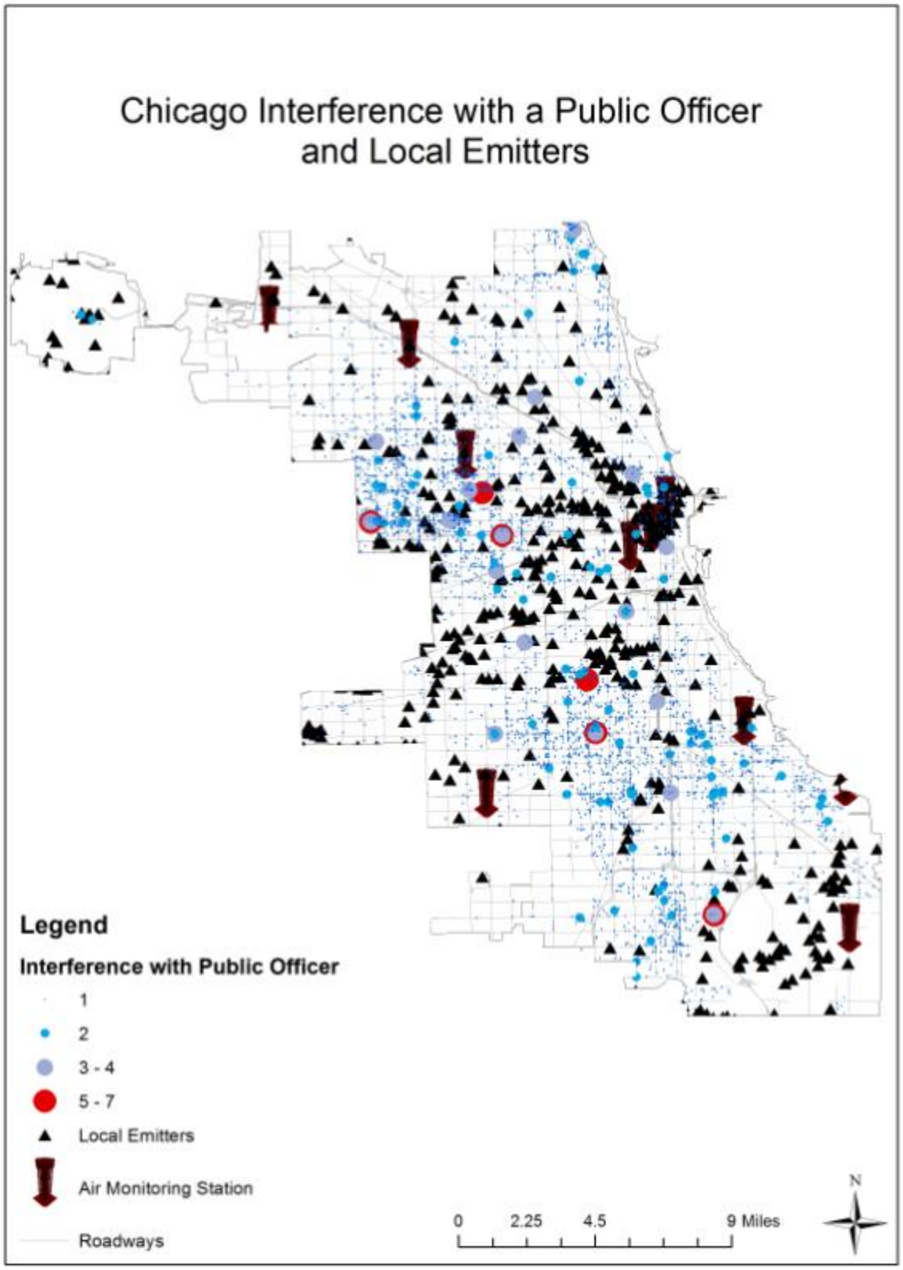


Figure 19f: Chicago Motor Vehicle Theft and Local Emitters

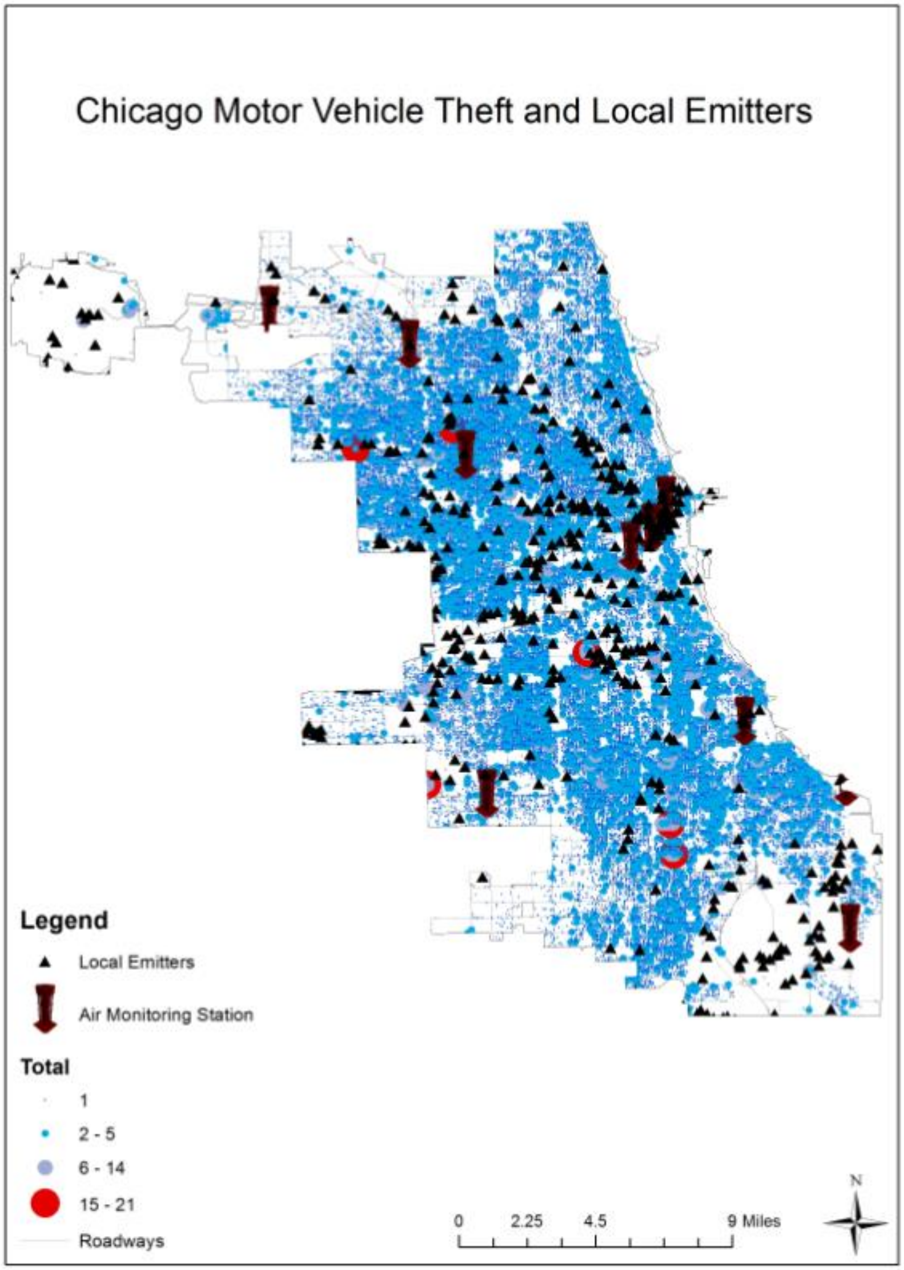


Figure 19g: Chicago Rape and Sex Crimes and Local Emitters

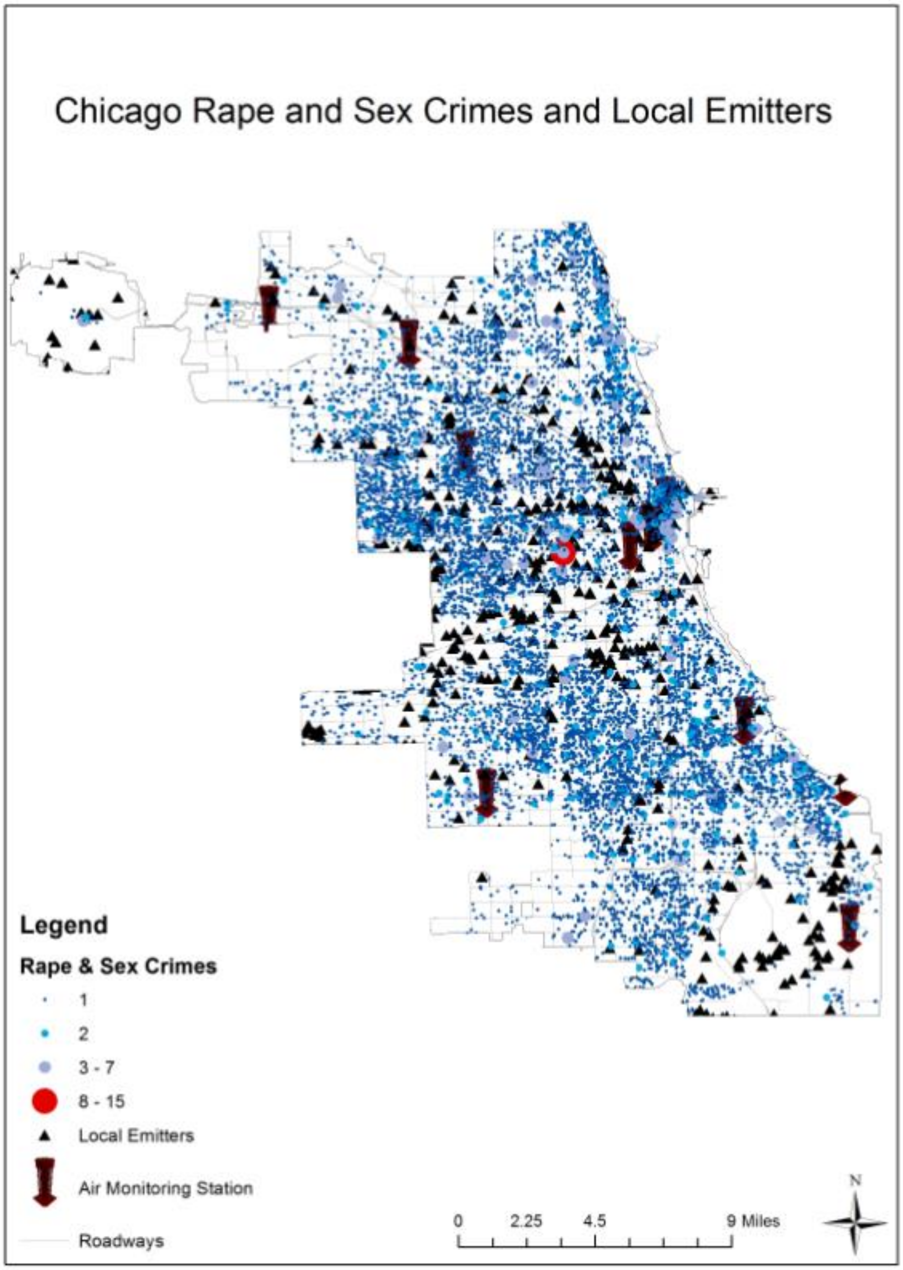


Figure 19h: Chicago Robbery Crimes and Local Emitters

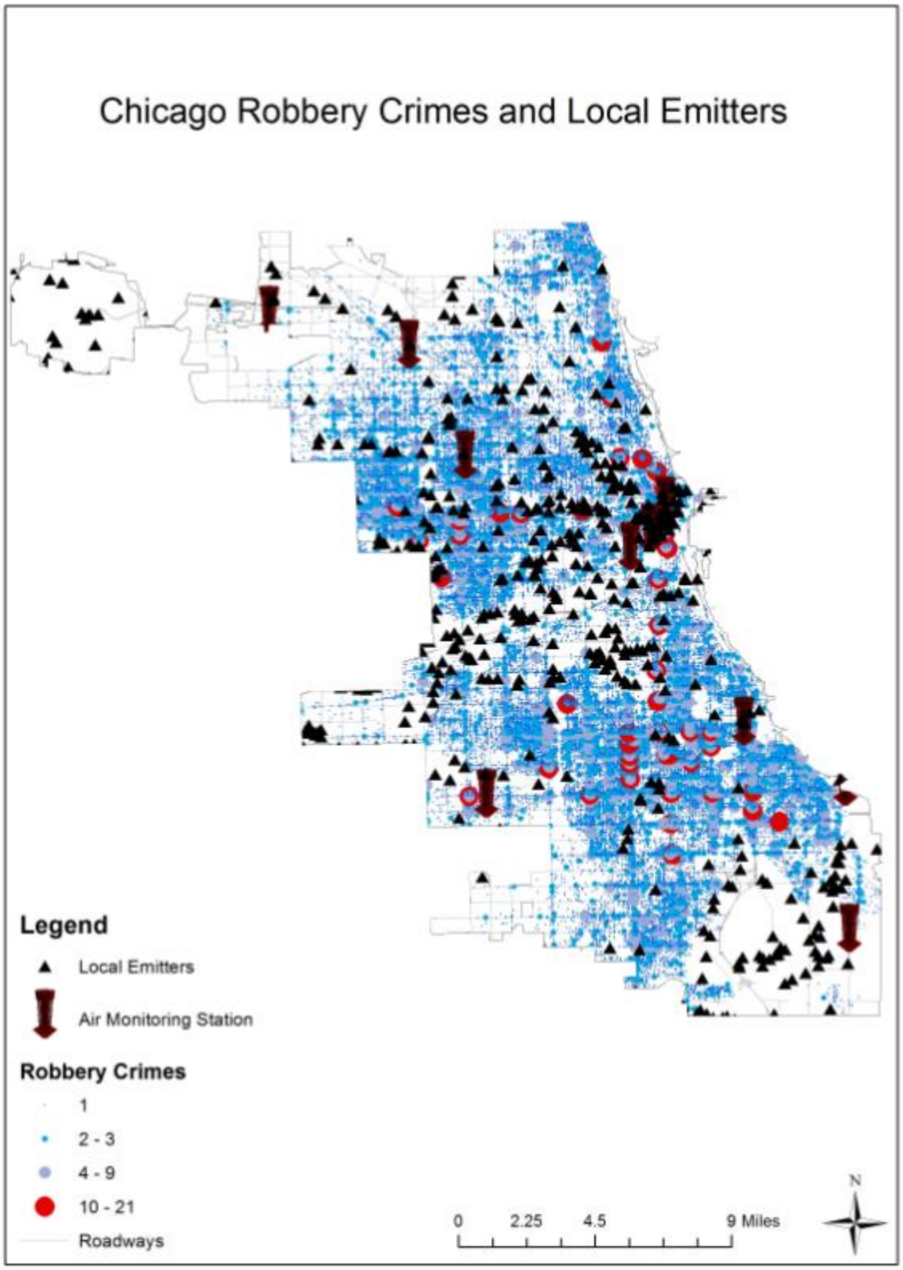


Figure 19i: Chicago Theft Crimes and Local Emitters

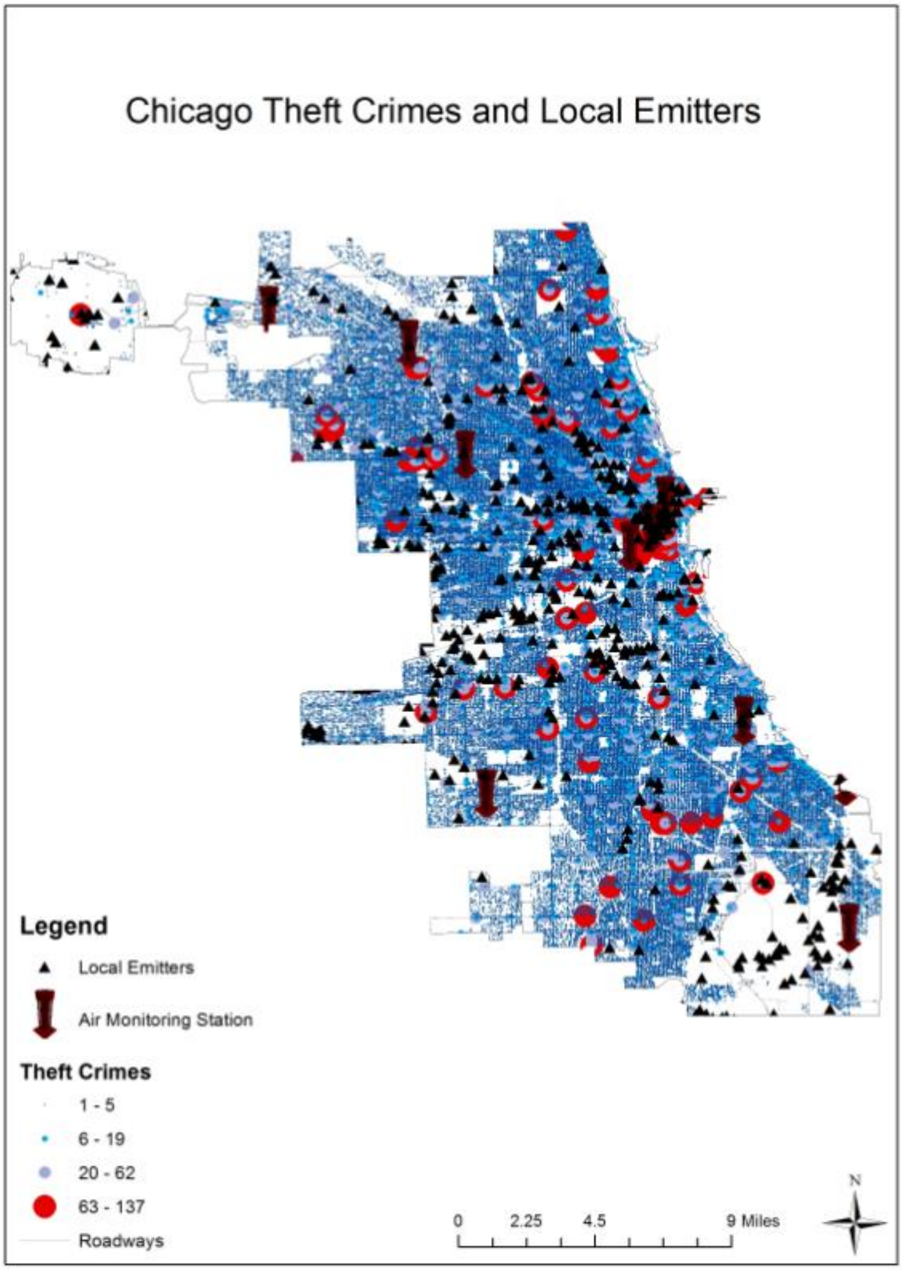


Figure 19j: Chicago Trespass Crimes and Local Emitters

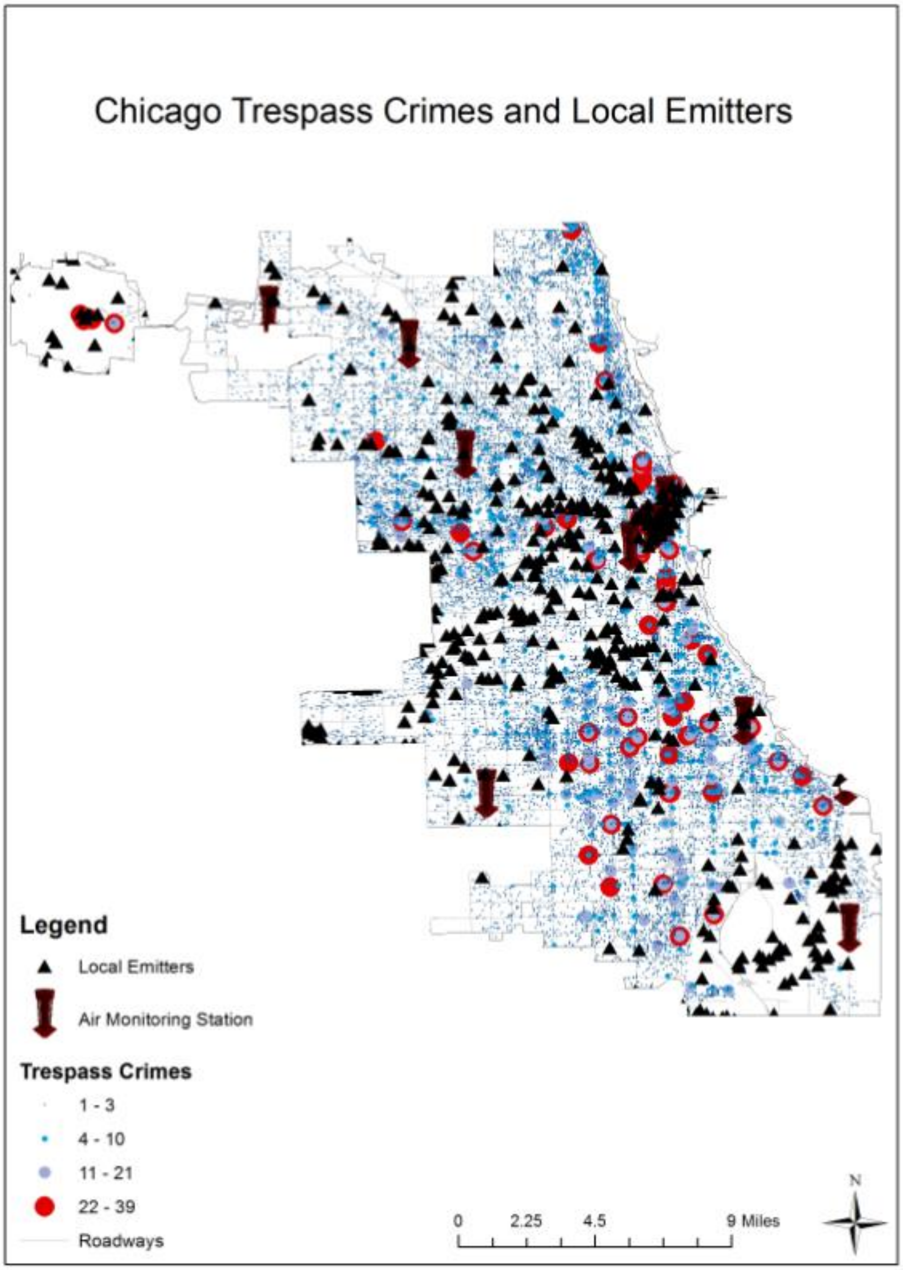


Figure 20a: Houston Assault Crimes and Local Emitters

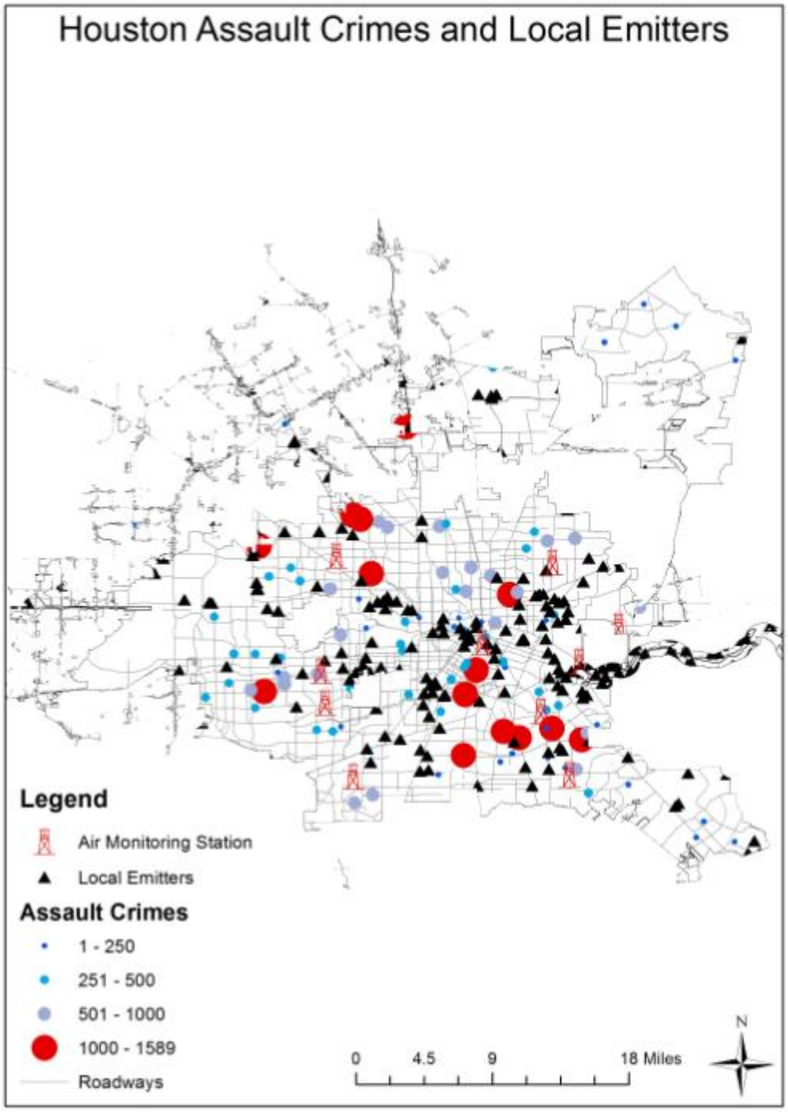


Figure 20b: Houston Burglary Crimes and Local Emitters

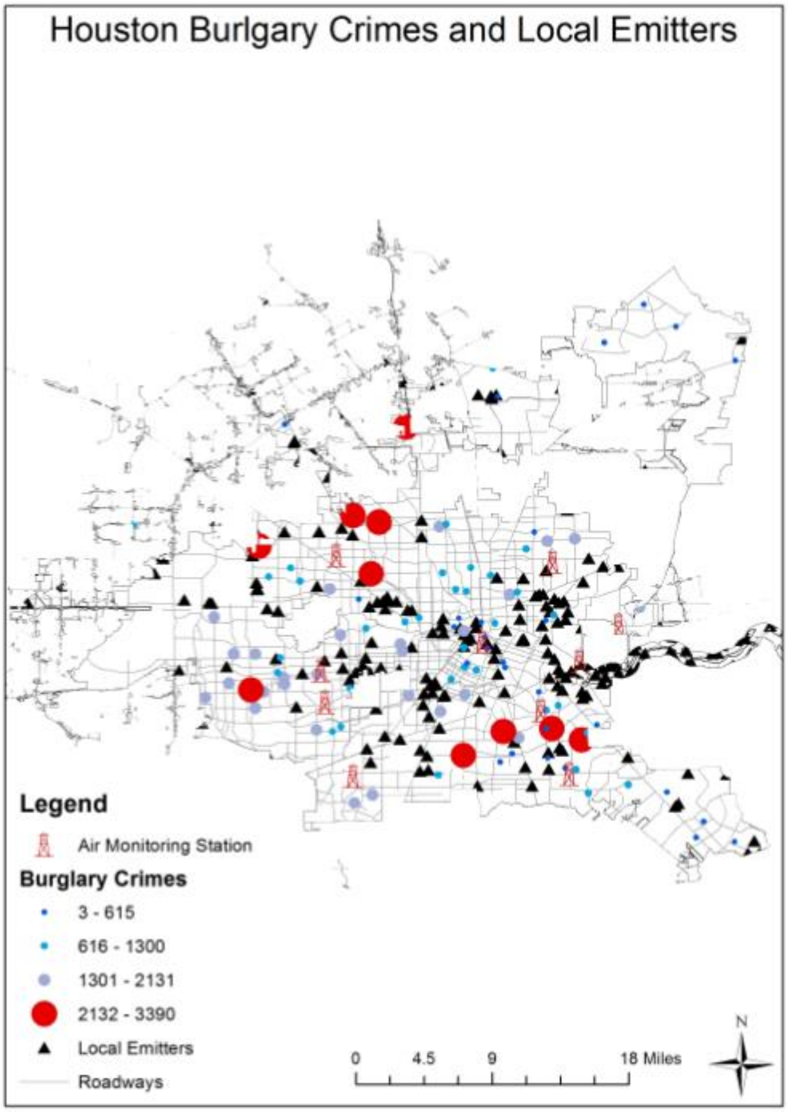


Figure 20c: Houston Homicide Crimes and Local Emitters

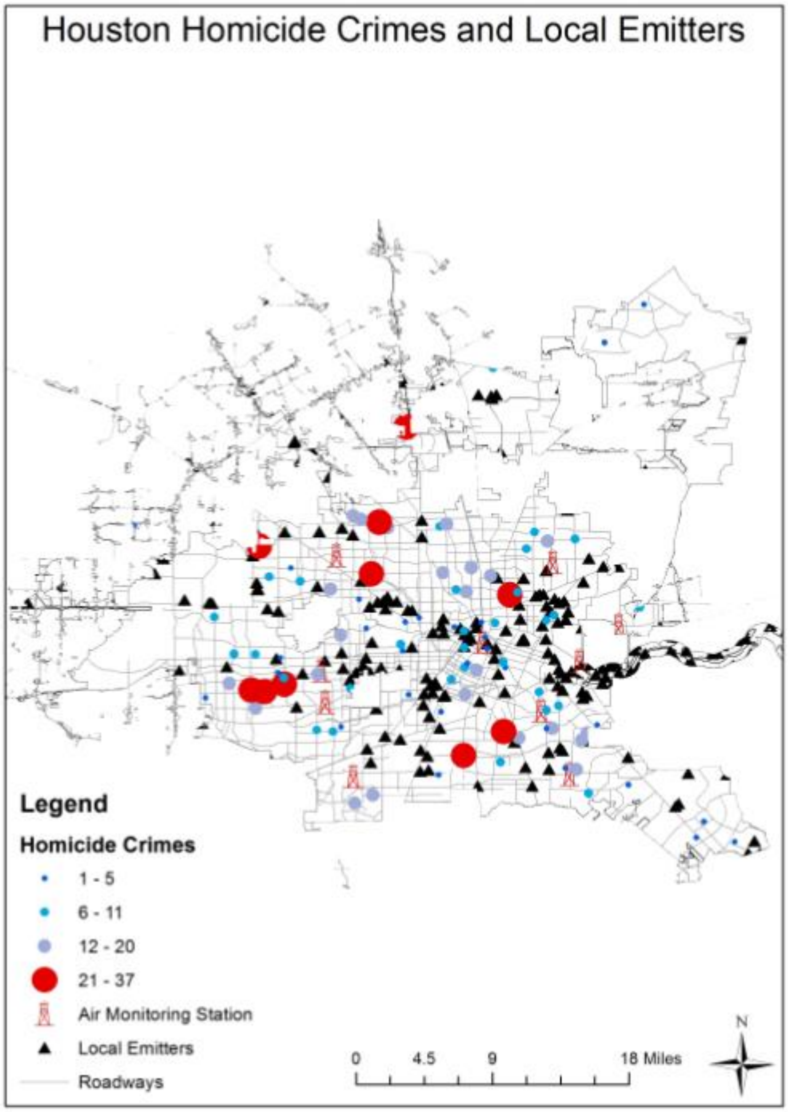


Figure 20d: Houston Motor Vehicle Theft Crimes and Local Emitters

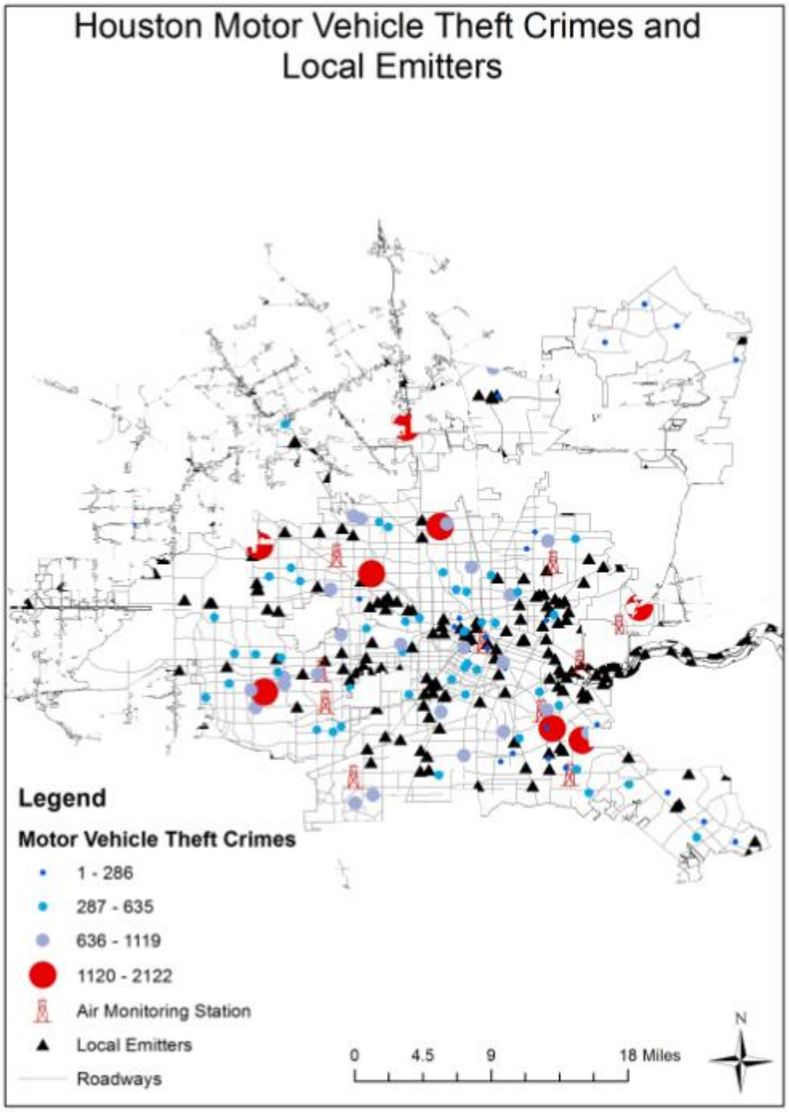


Figure 20e: Houston Rape and Sex Crimes and Local Emitters

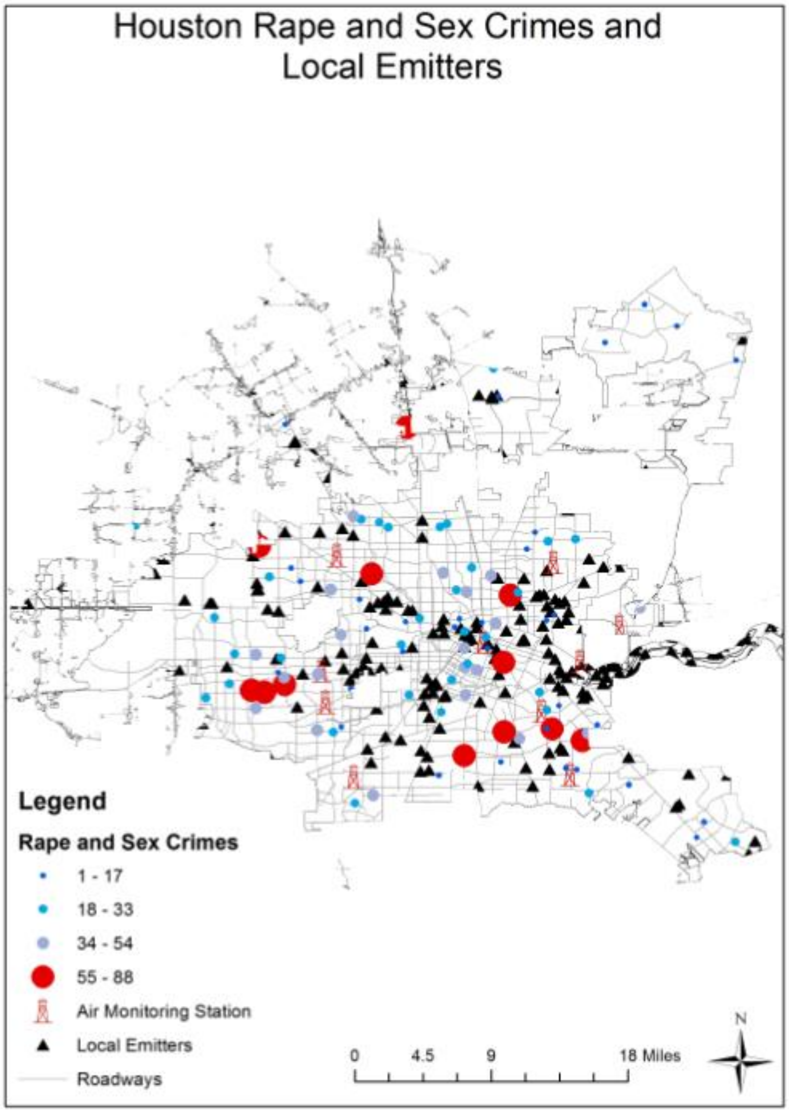


Figure 20f: Houston Robbery Crimes and Local Emitters

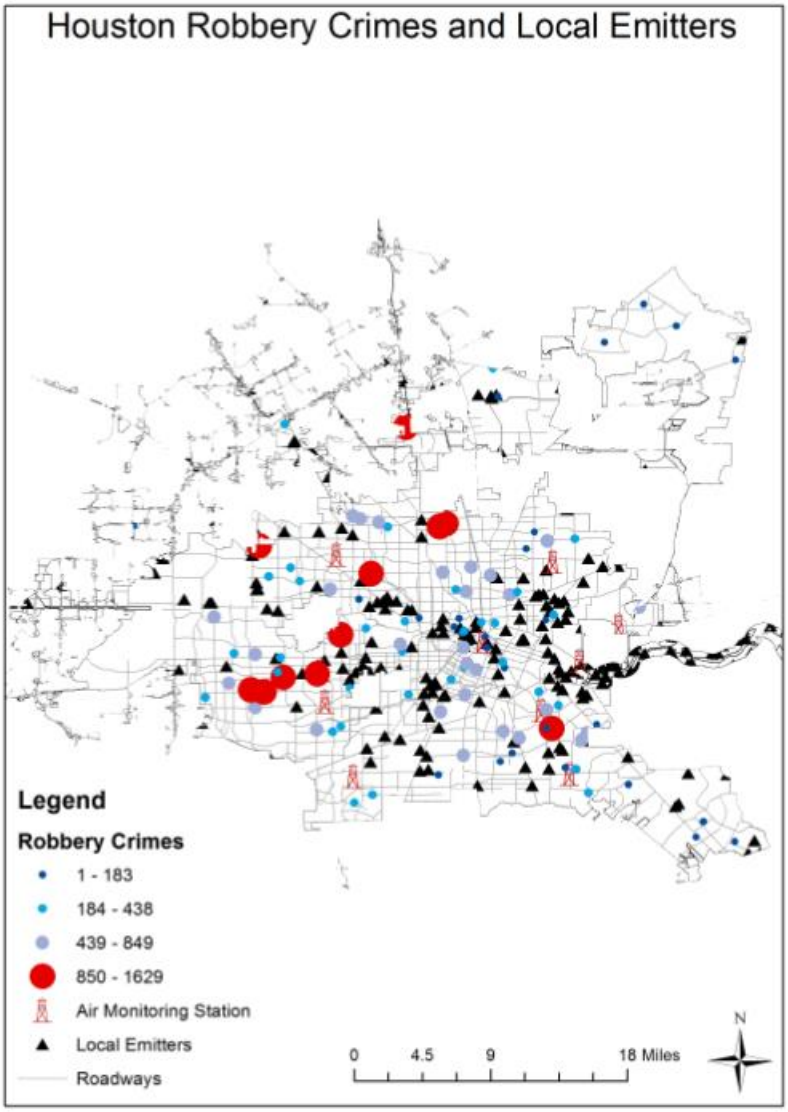


Figure 20g: Houston Theft Crimes and Local Emitters

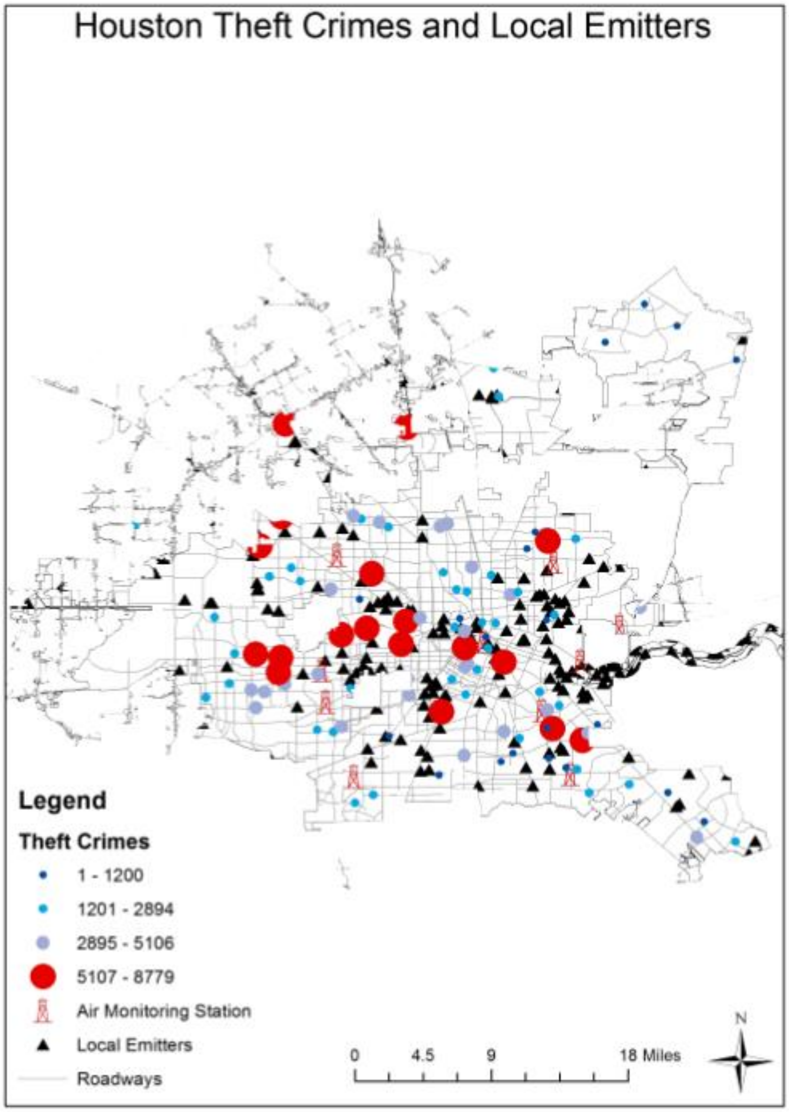


Figure 21a: Philadelphia Assault Crimes and Local Emitters

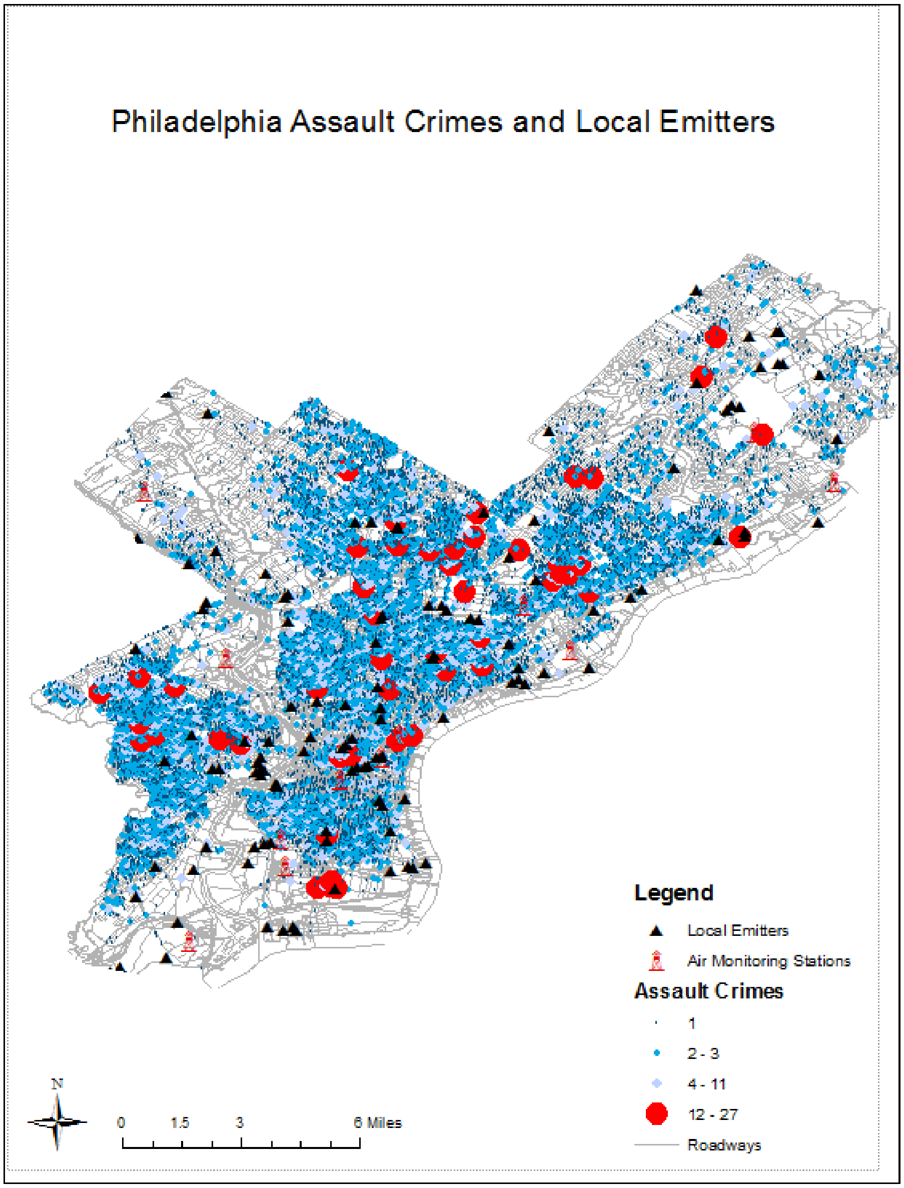


Figure 21b: Philadelphia Burglary Crimes and Local Emitters

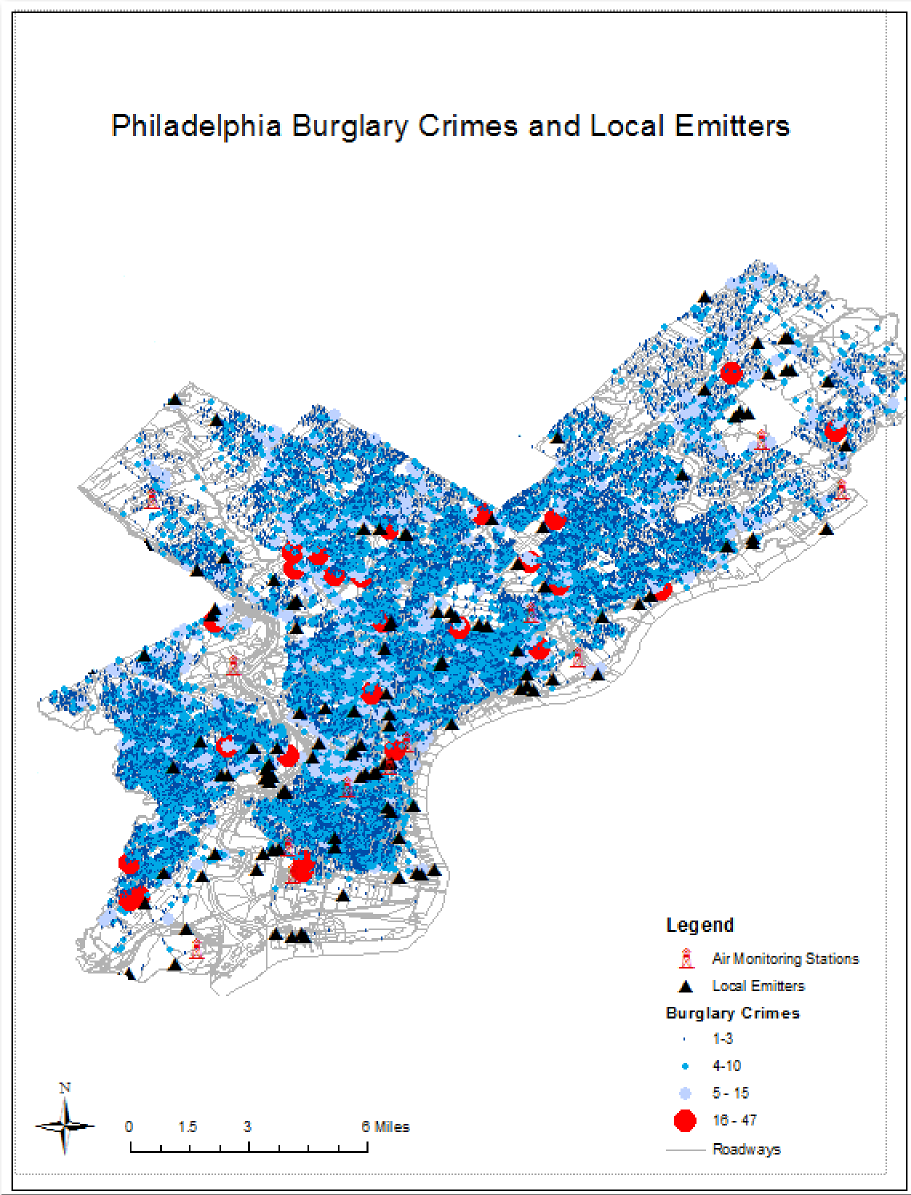


Figure 21c: Philadelphia Homicide Crimes and Local Emitters

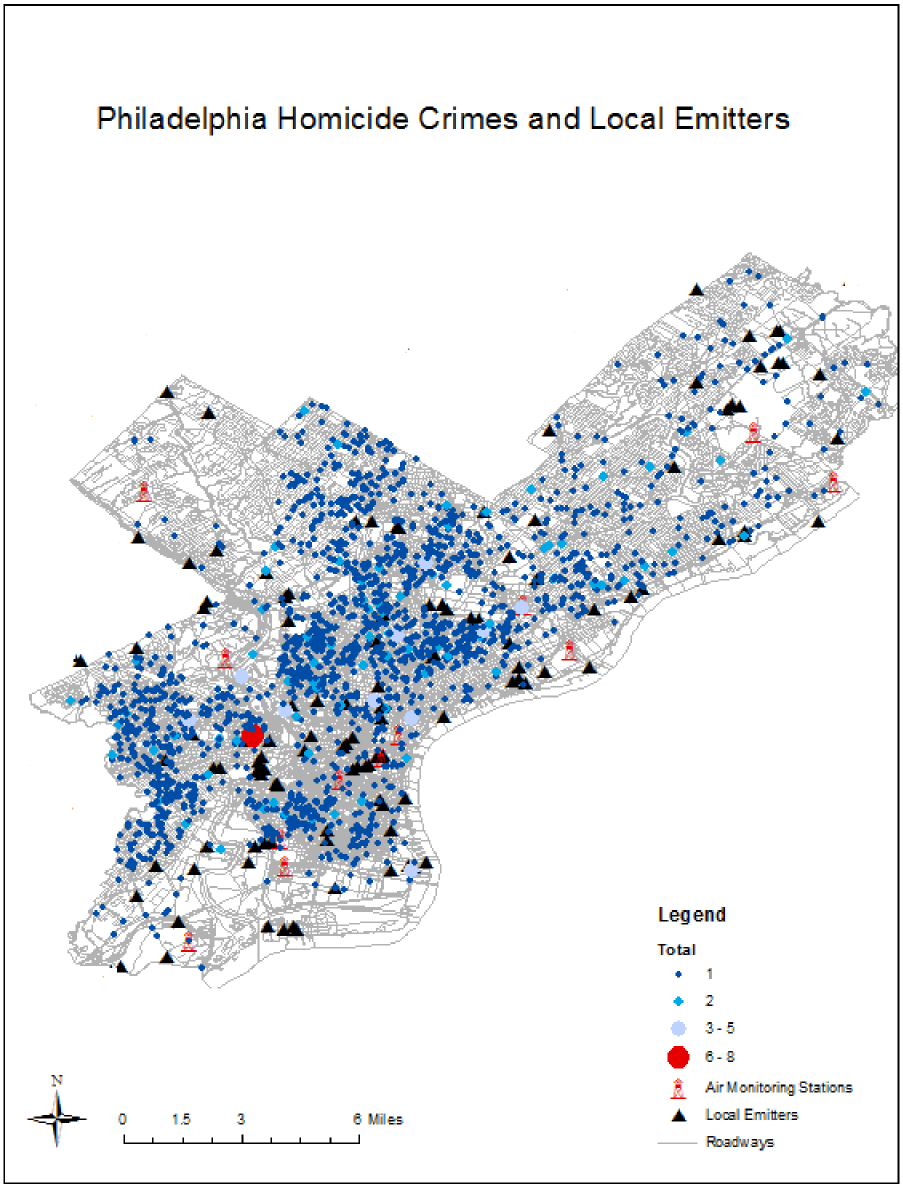


Figure 21d: Philadelphia Motor Vehicle Theft Crimes and Local Emitters

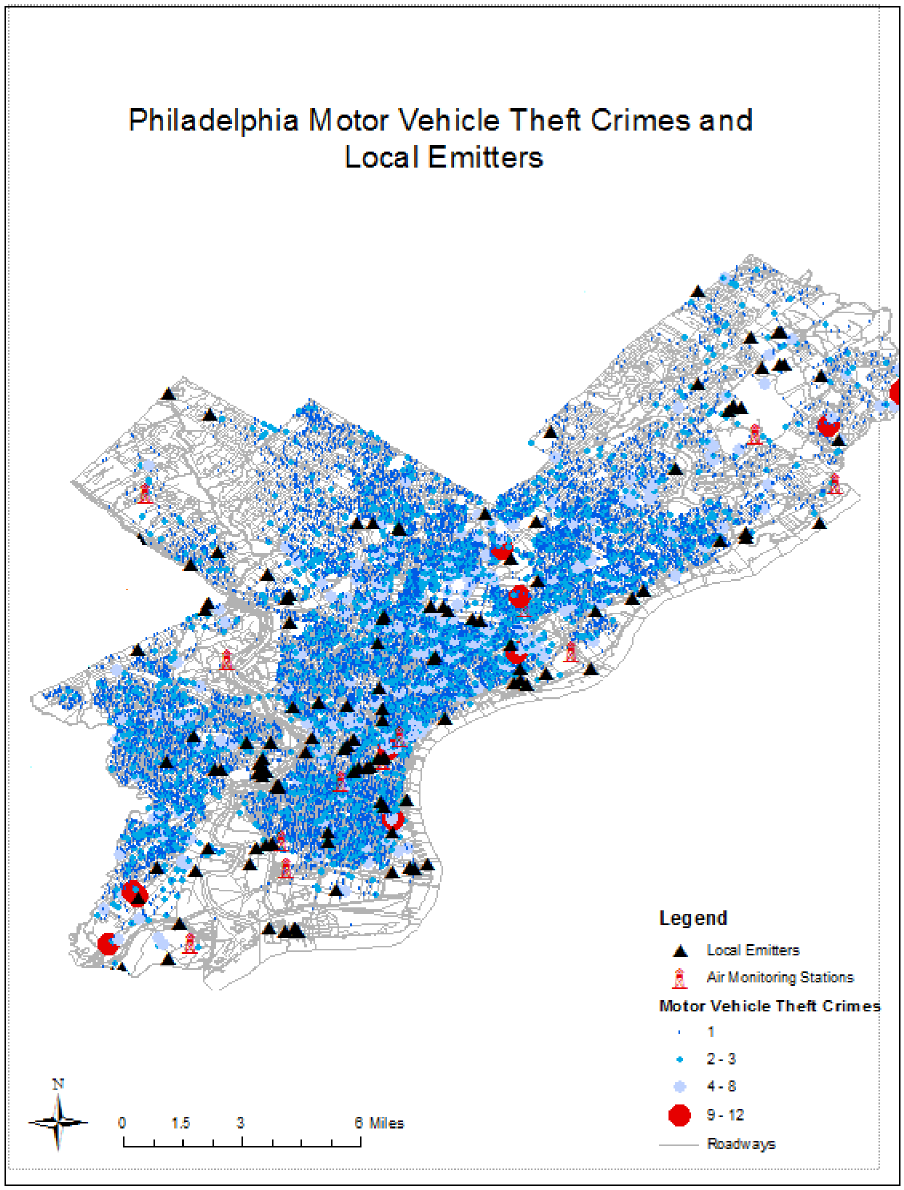


Figure 21e: Philadelphia Rape and Sex Crimes and Local Emitters

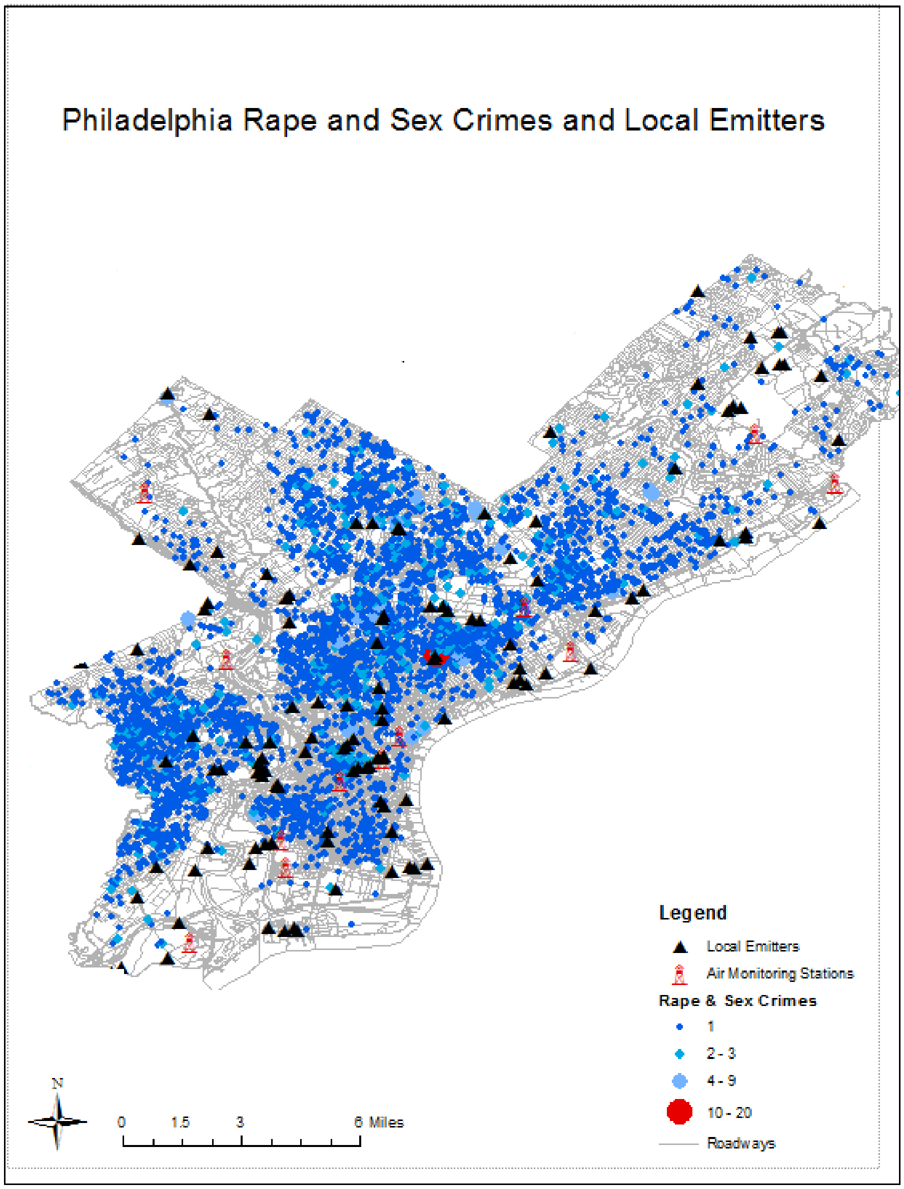


Figure 21f: Philadelphia Robbery Crimes and Local Emitters

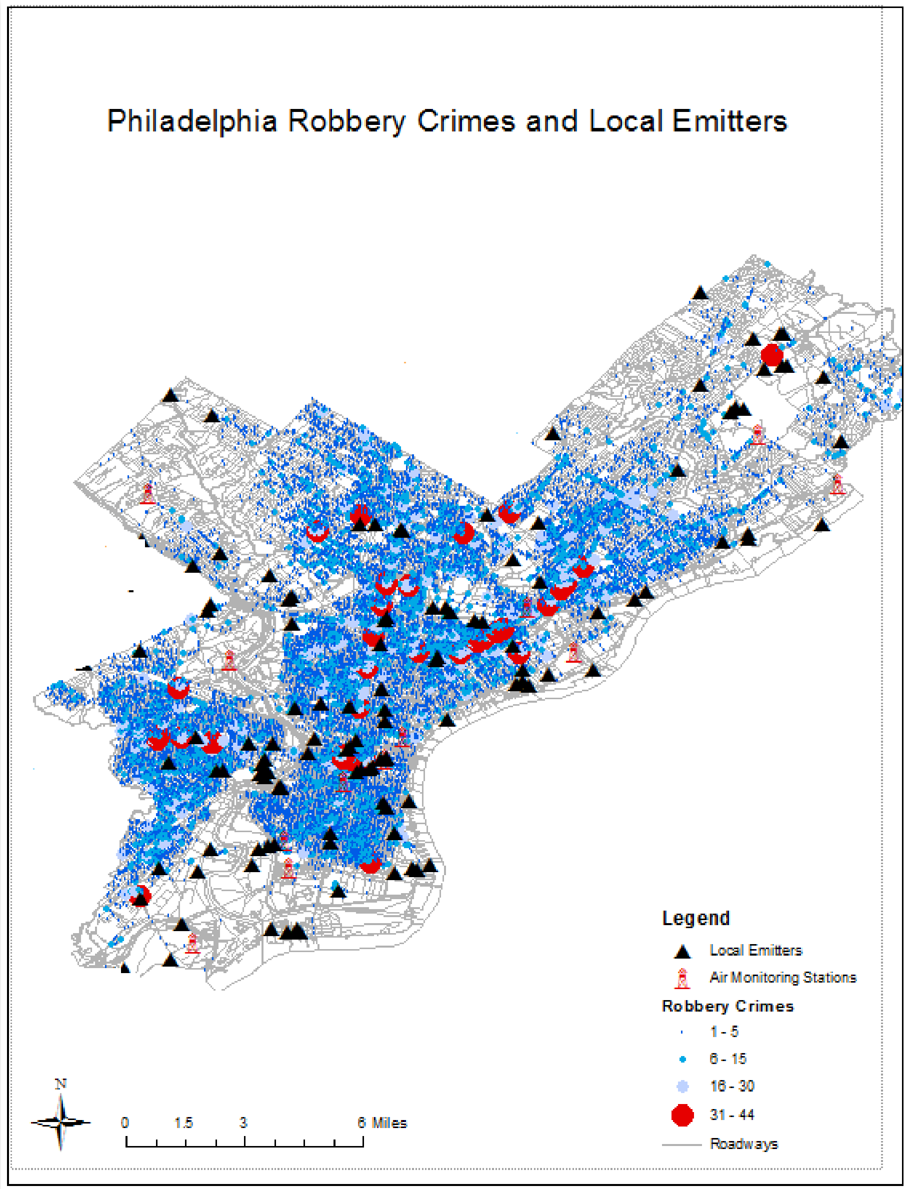


Figure 21g: Philadelphia Theft Crimes and Local Emitters

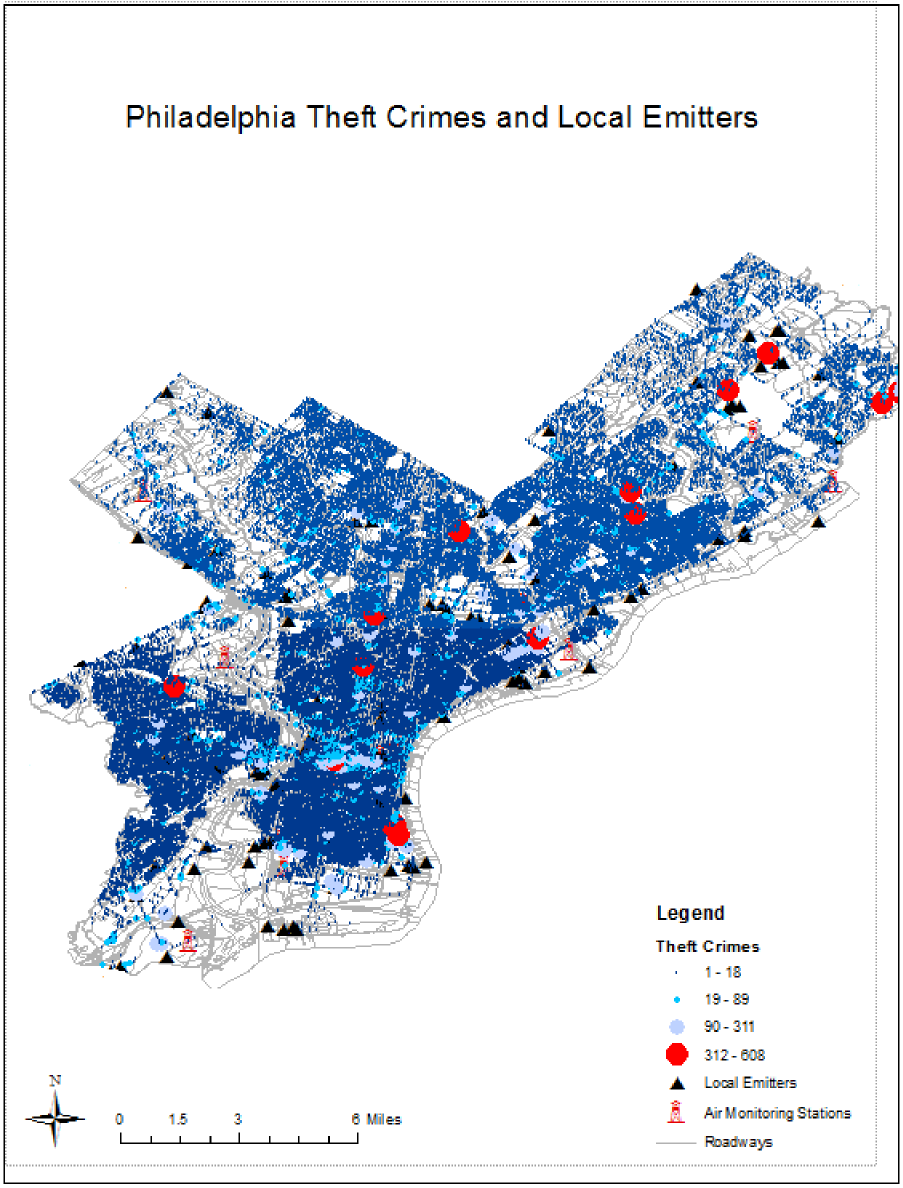


Figure 22a: Seattle Arson and Reckless Burning Crimes and Local Emitters

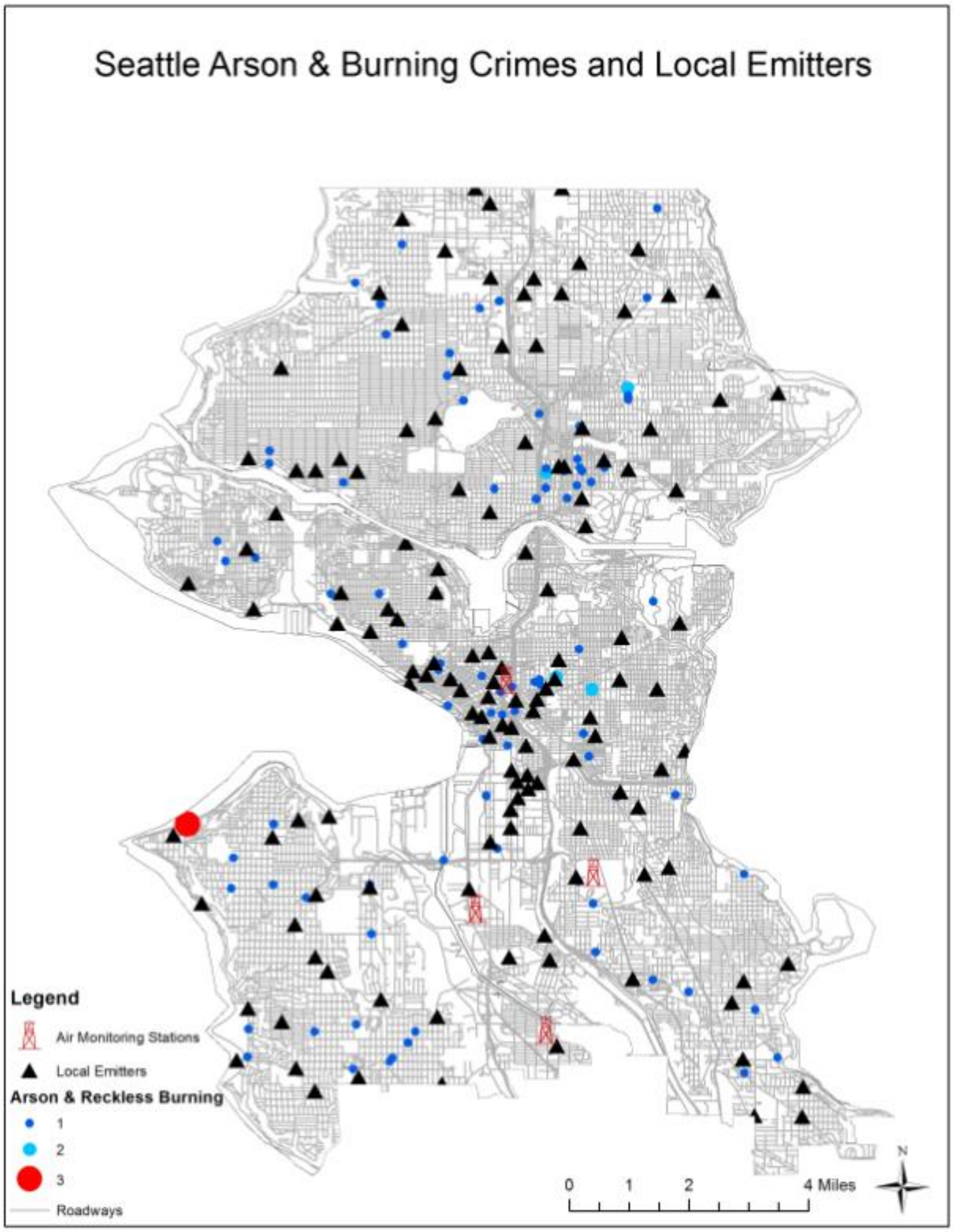


Figure 22b: Seattle Assault Crimes and Local Emitters

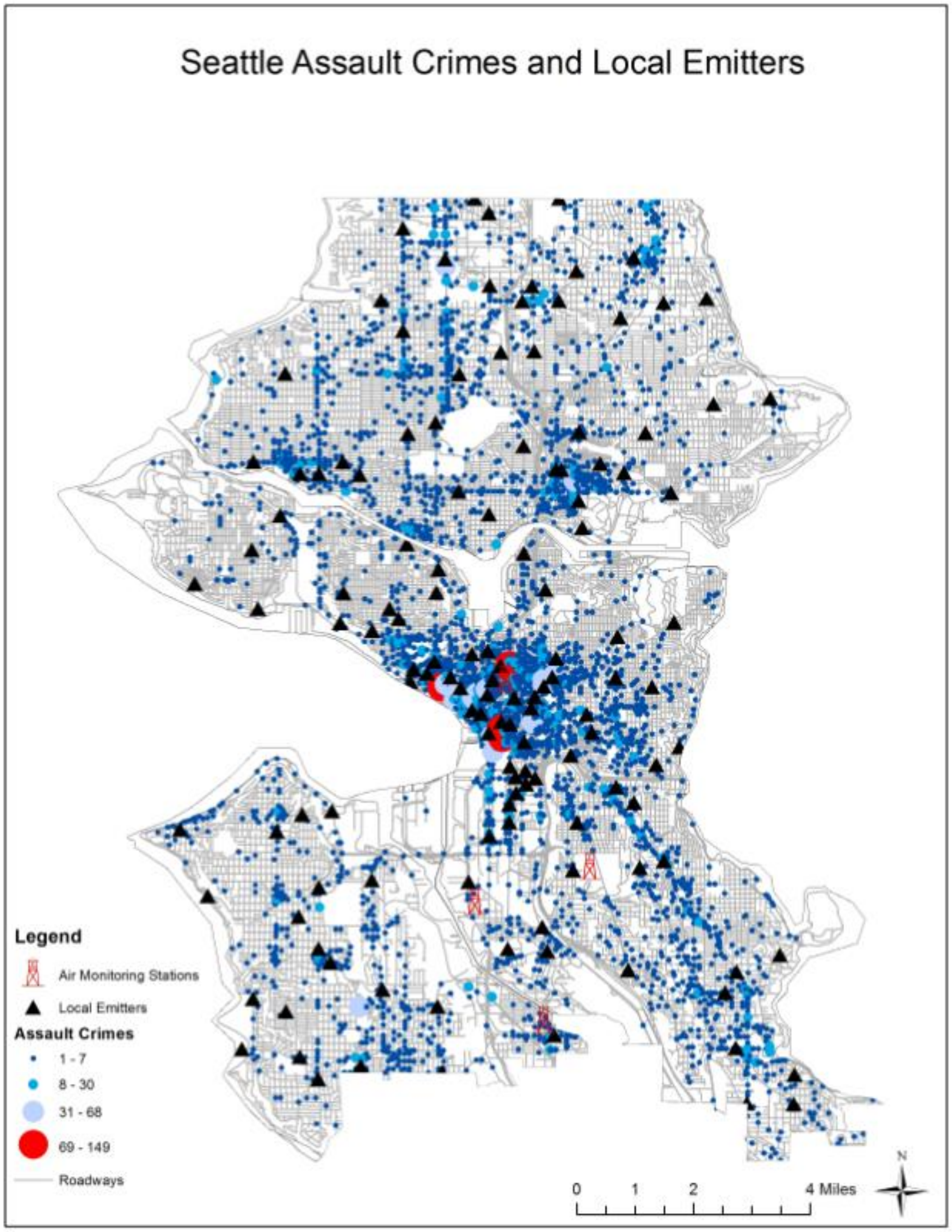


Figure 22c: Seattle Burglary Crimes and Local Emitters

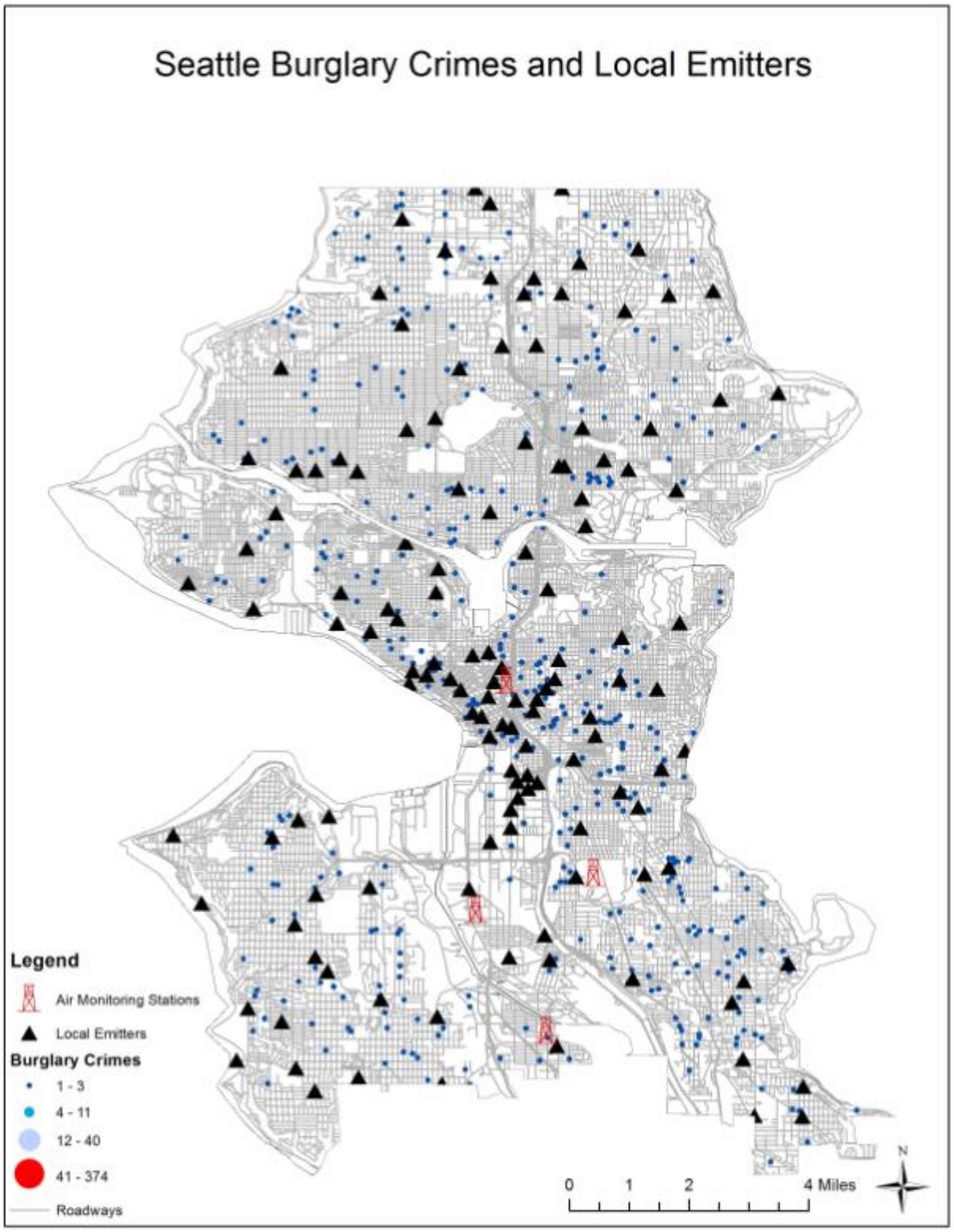


Figure 22d: Seattle Damage Crimes and Local Emitters

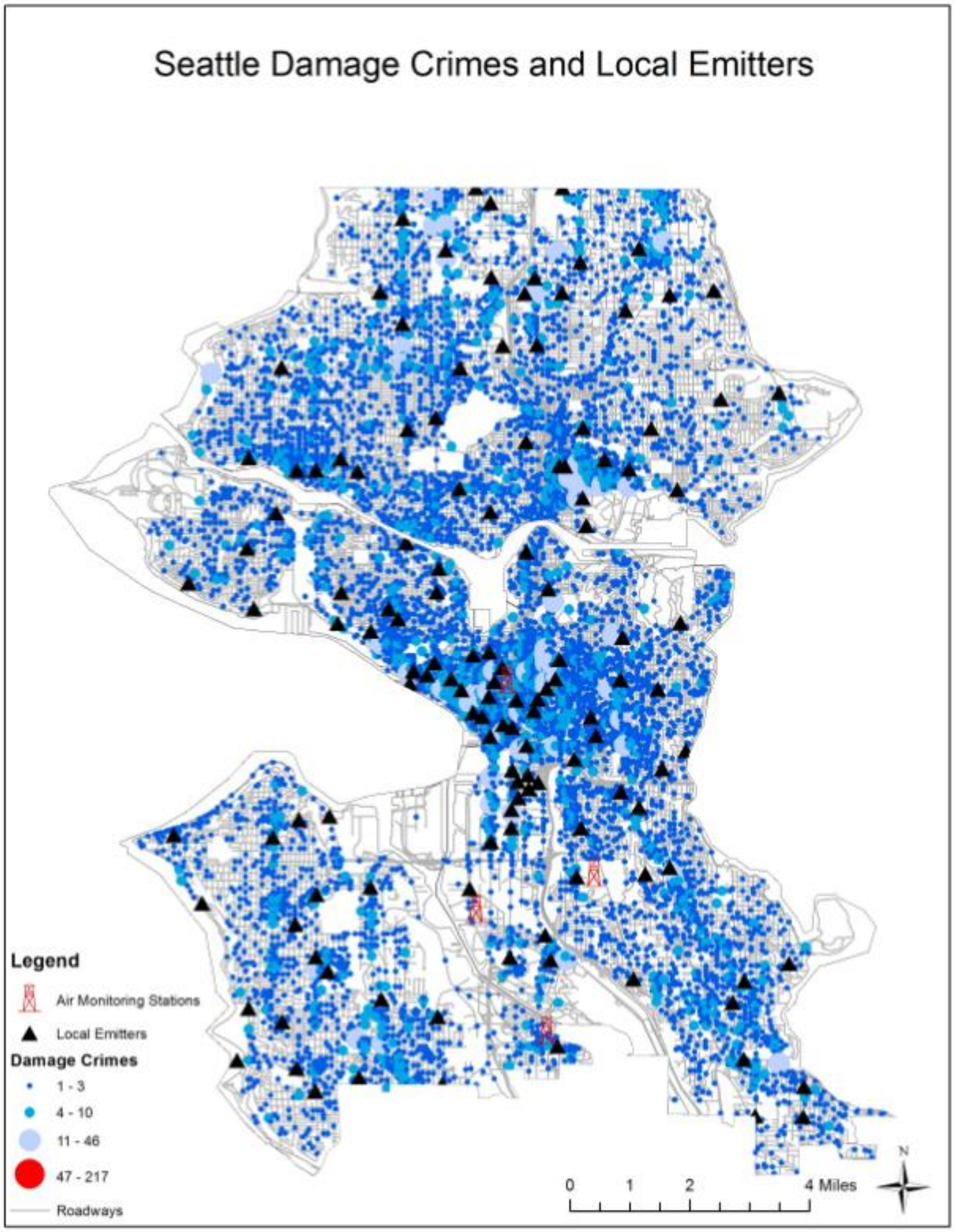


Figure 22e: Seattle Disorderly Conduct Crimes and Local Emitters

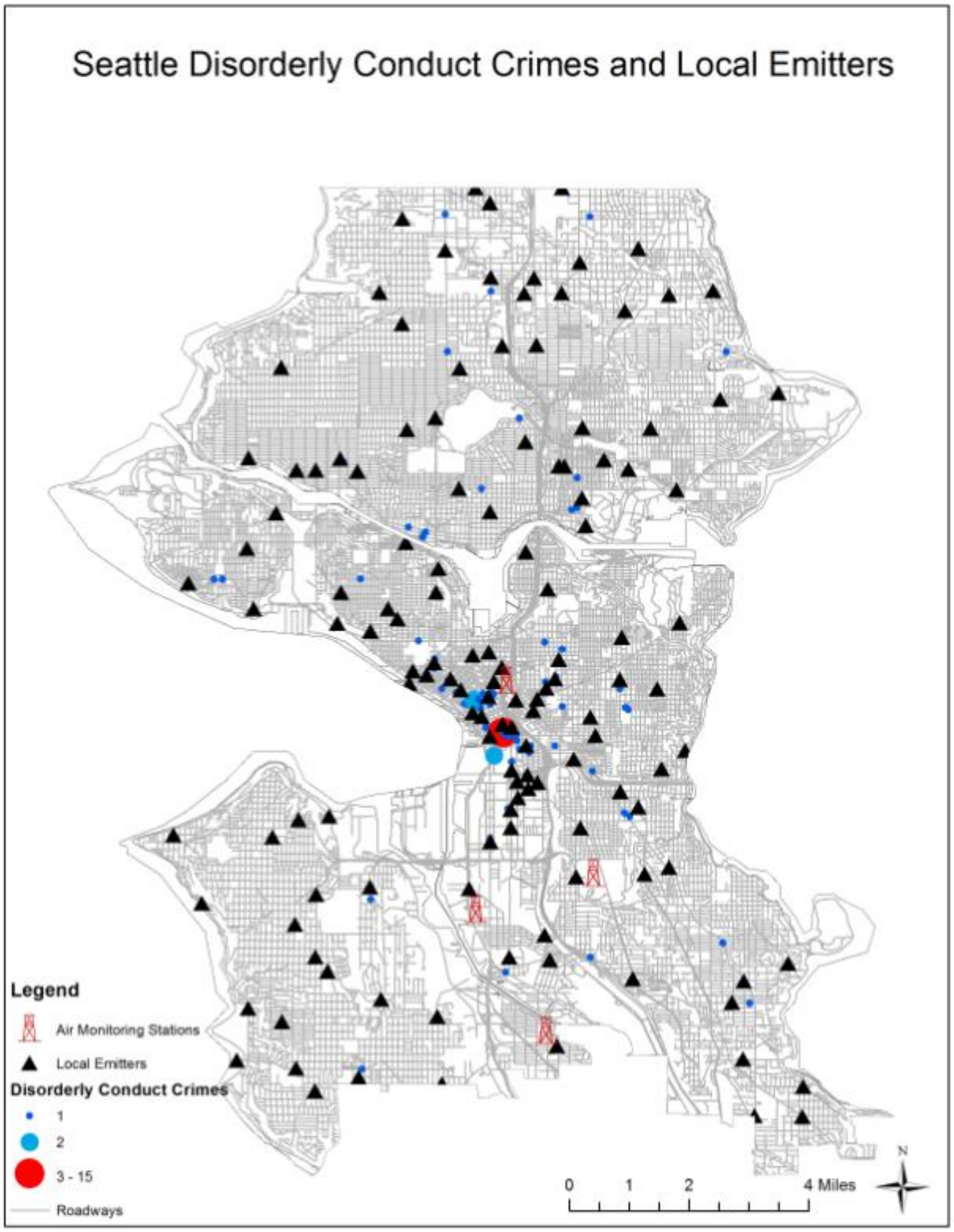


Figure 22f: Seattle Harassment Crimes and Local Emitters

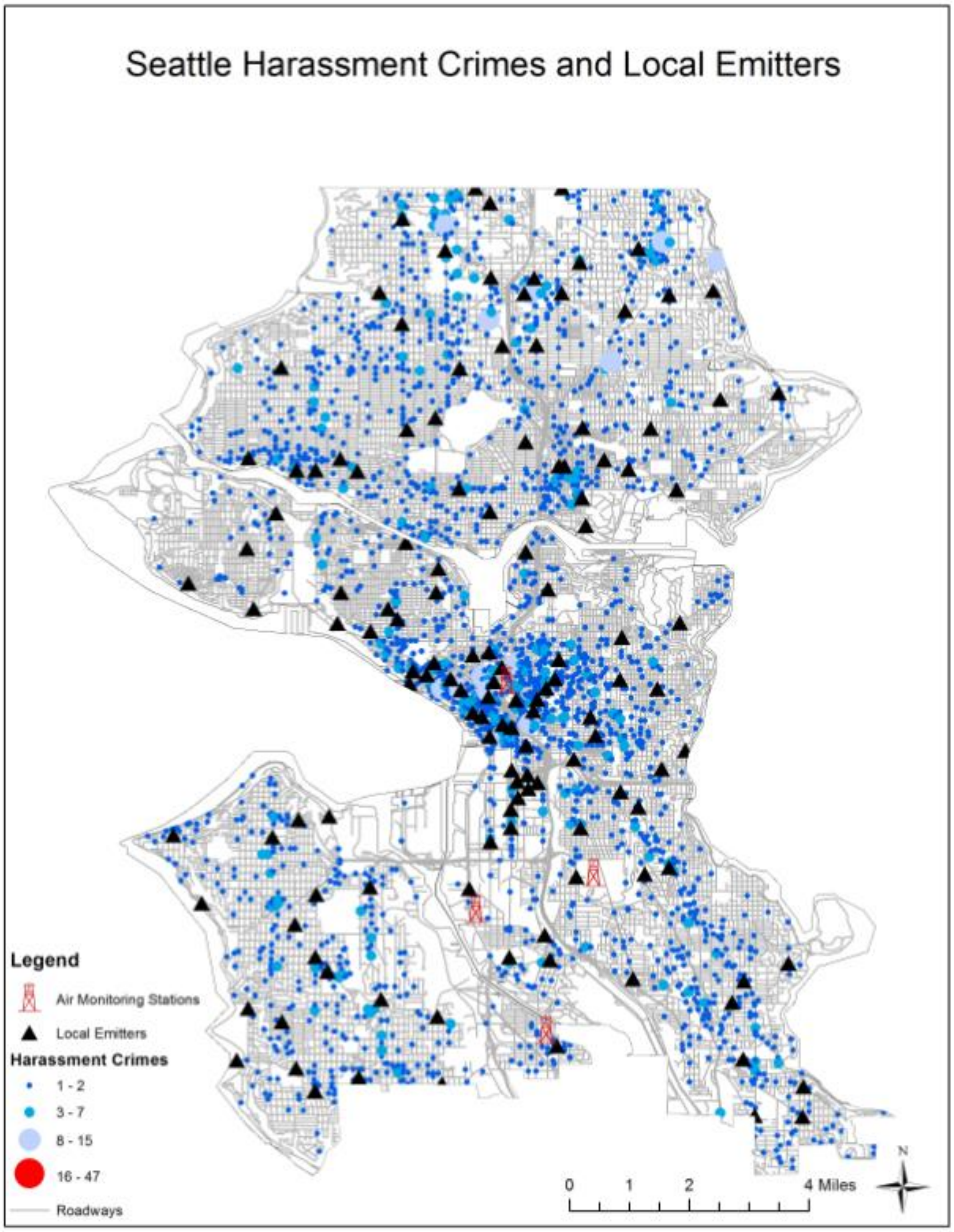


Figure 22g: Seattle Homicide Crimes and Local Emitters

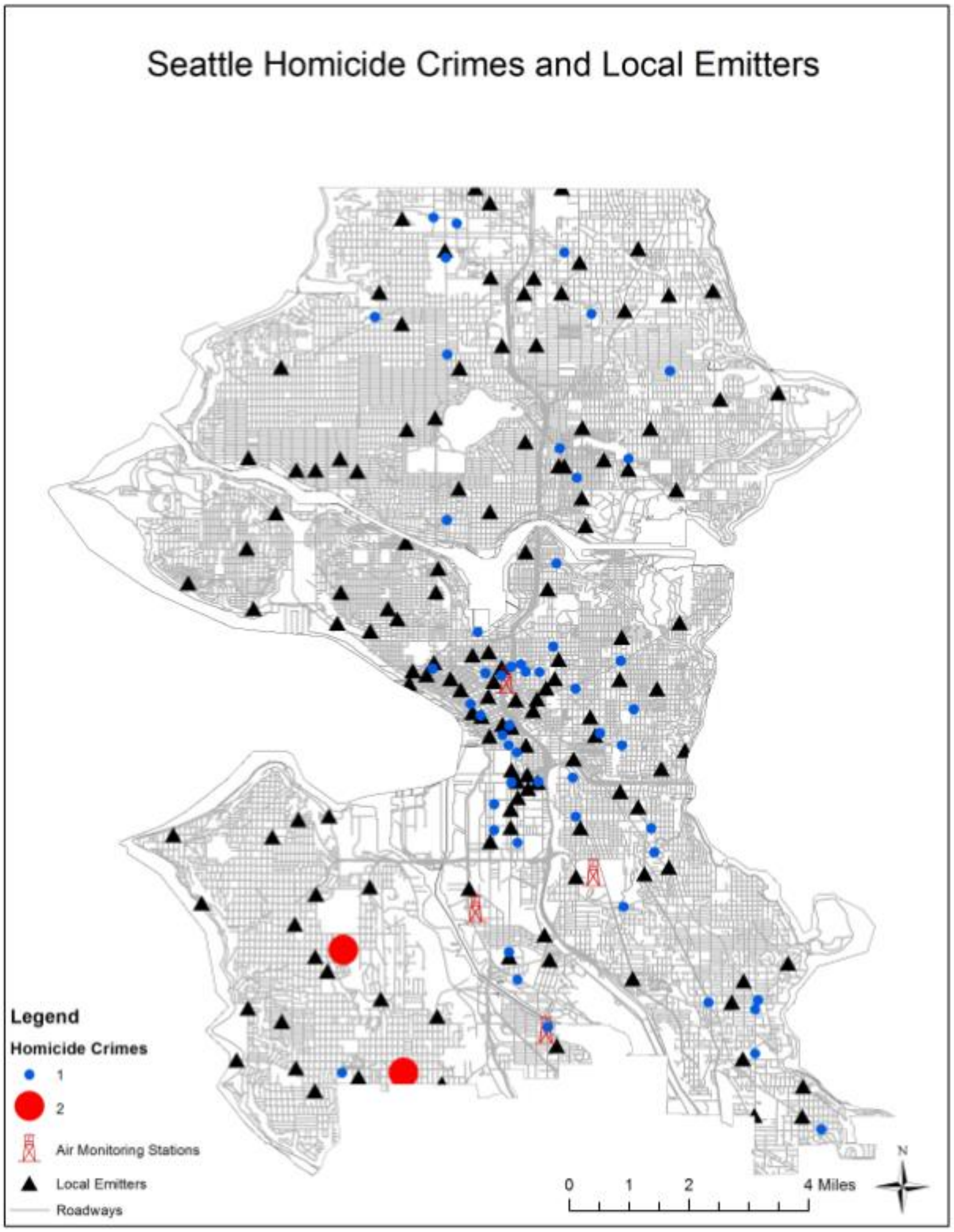


Figure 22h: Seattle Motor Vehicle Theft Crimes and Local Emitters

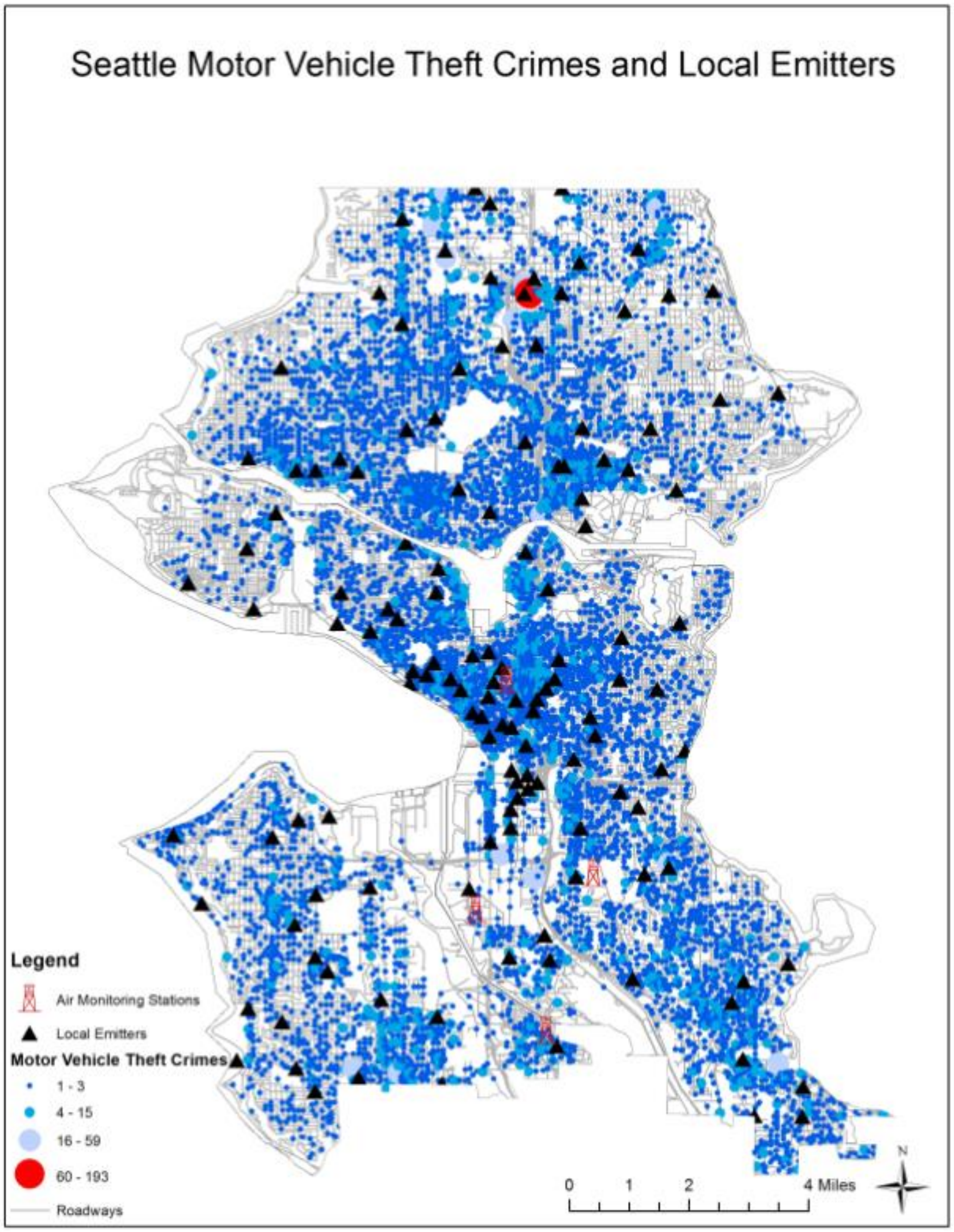


Figure 22i: Seattle Robbery Crimes and Local Emitters

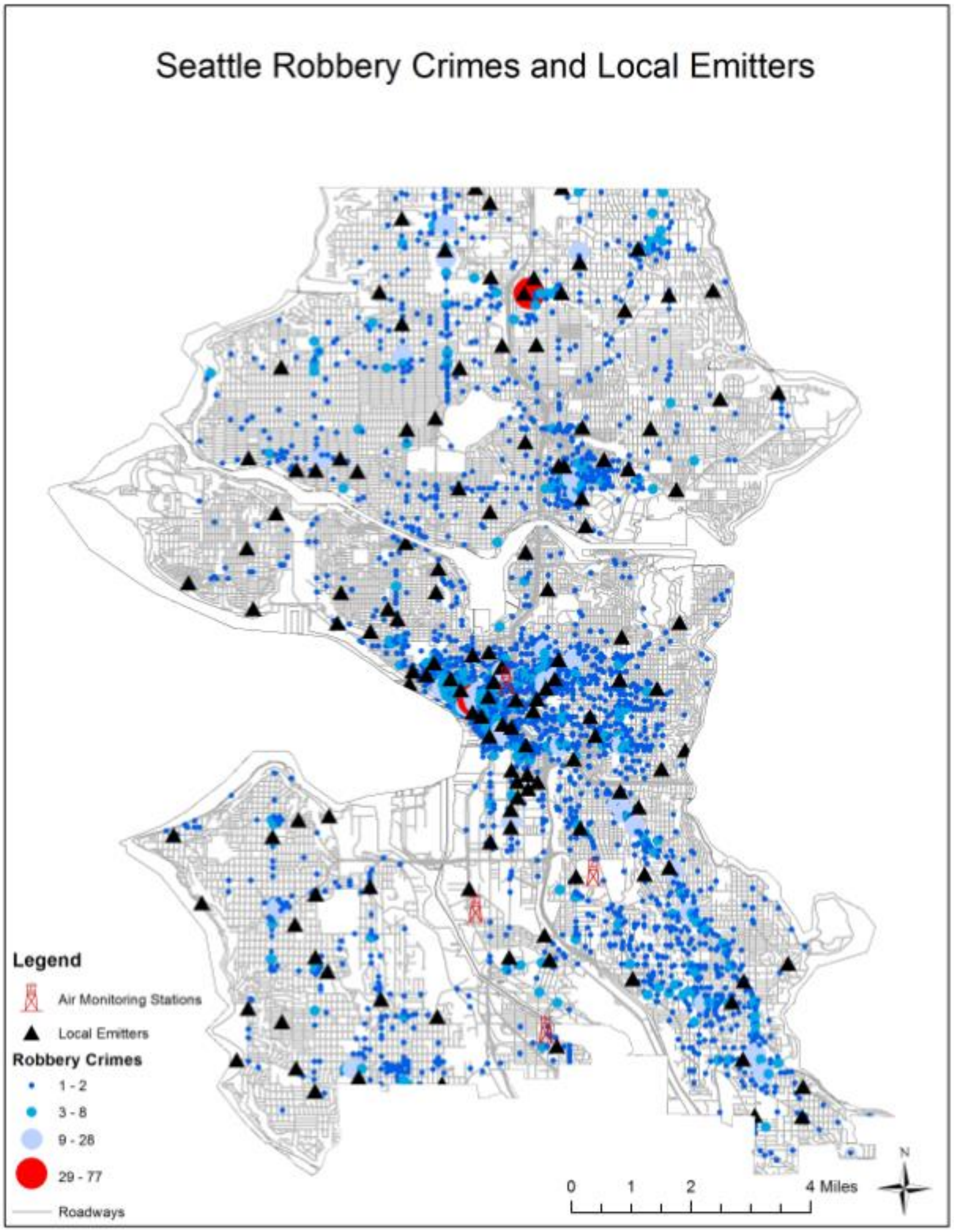


Figure 22j: Seattle Theft Crimes and Local Emitters

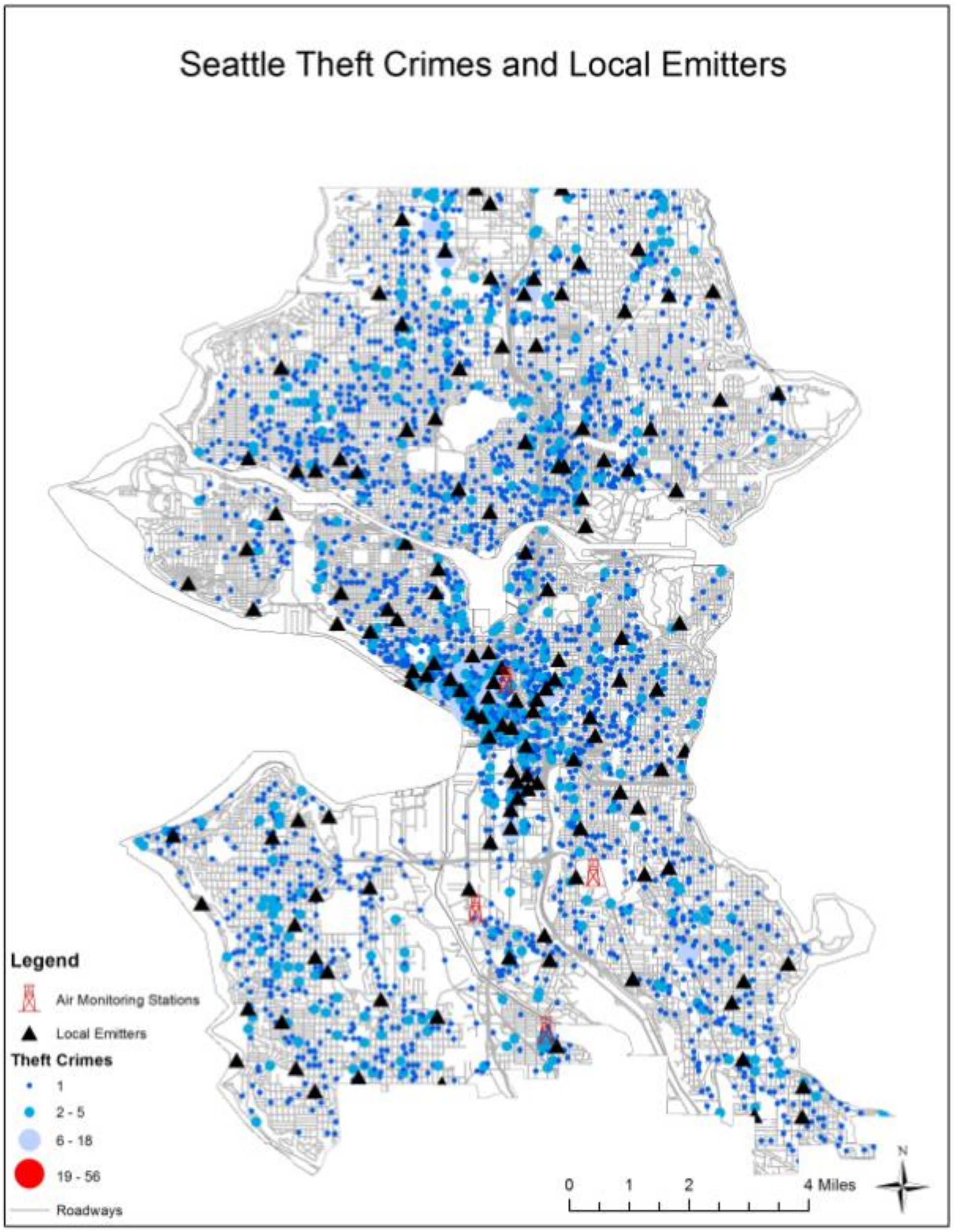
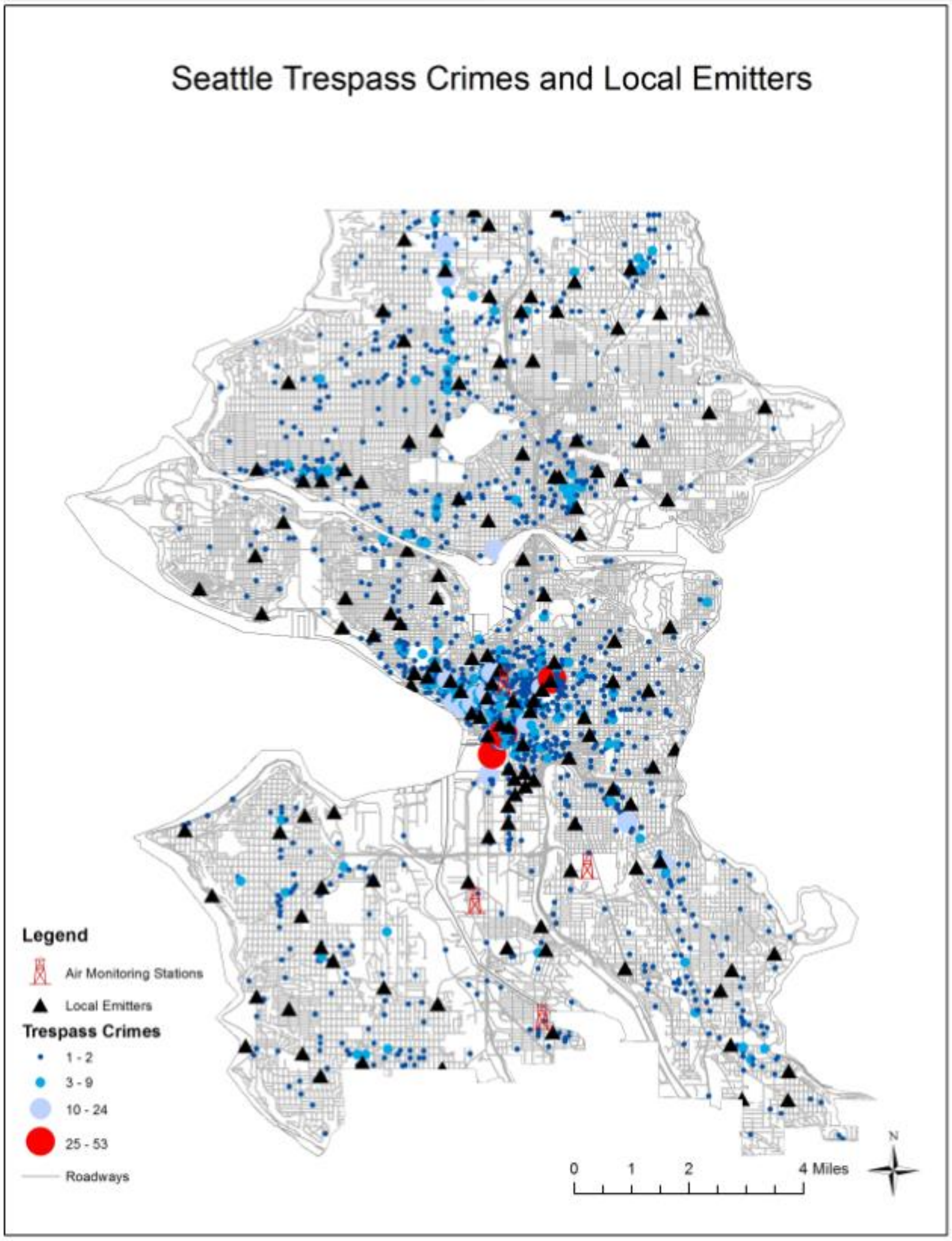


Figure 22k: Seattle Trespass Crimes and Local Emitters



Discussion

The results of this study were consistent with other studies which demonstrated a seasonal relationship between increases and decreases in crime rates. This study, however, also showed how the most common season for increased crime rates varied by crime type. For example, assault crimes were most likely to occur in the spring while burglary crimes were more likely to happen in the fall and theft crimes in the summer. Similarly, this study also showed how days of the week also had a relationship with increases in crime. This study also supports but expands the recent findings of Andersen and Malleson (2015), who focused on the intra-week spatial-temporial patterns of crime and concluded, in general, more crimes occurred on the weekend. While this study also showed higher crime rates on weekends for assaults and homicides, many of the non-violent crime categories considered occurred on the weekdays. These results make sense as it is harder to commit a robbery or theft when people are home and/or out in the community, making target areas crowded and less appealing.

This study suggested environmental factors could have an impact on crime rates with both positive and negative associations possible. When looking at the weather/climate variables, for example, as apparent temperature increased, so did the number of several different crime categories. Fay and Maner (2014) reported heat exposure promoted hostile social responses, supporting the findings that increased apparent temperatures related to increases in crime. Similarly, Ely et al (2013) reported increases in ambient temperatures over short periods of time can lead to fatigue, confusion, anger and depression., The findings of this study supported how feeling hot and being exposed to increased ambient air temperatures may promote anger and hostility, increasing the number of crimes of various types.

Interestingly, only two of the eleven statistically significant results for humidex were associated with increased numbers of the particular crime type. Additional studies should explore this further, as it would seem reasonable for the same irritation or anger observed during higher temperatures to also occur during higher humidity and/or higher temperature and humidity combinations (e.g., urban summers). It is possible higher ambient air temperatures cause a physiological response that is muted when humidity is high. Future studies should look at the relationships between these factors.

Statistically significant results observed for visibility were positive. This finding is likely due to more people being outside on clear and nice days, increasing the opportunity for crime to occur. As noted by Weisburb et al (2014), offenders in immediate situational opportunities increased the likelihood of a crime occuring, so good weather and good visibility could increase these situations.

Wind speed had a significant relationship with increased crime for seven of the ten significant findings. When looking at the types of crimes increasing with wind speed, data suggested harsher environments caused by rapid wind speeds could perhaps provoke assaults, but may also result in the offender trying to seek cover, leading to increases in motor vehicle thefts and trespassing. Five of the six significant findings for cloud cover showed increased numbers of crime as cloud cover increased. This supports Donovan and Prestemon's (2012) finding, which was small obstructions were associated with increases in crime. Though their study focused on trees, the darkness created by heavy cloud cover seemed to yield similar results in this study. These findings indicated decision making may change based on weather conditions.

Carbon monoxide (CO) is known to cause irritability in those exposed at high air concentrations or doses (CDC, 2012). Based on this, the results from the Chicago model would be expected. Six of the seven significant results in the model suggested when CO concentrations increased from the 25th percentile to the 75th percentile, crimes increased. However, the Seattle model had opposite results with significant findings showing a decrease in crimes when CO concentrations similarly increased. As summarized in Table 24, the average daily CO concentrations in the present study's time period were higher in Chicago than in Seattle, however, it is unclear if the differences observed between models are simply due to Chicago having higher concentrations. In addition, the overall concentrations of CO throughout study cities were low and in most cases less than 1.0 ppm, which is 8.0 ppm less than the current NAAQS 8-hour standard (EPA, 2015e).

In all but one case, the statistically significant relationships associated with increases in ozone (O_3) resulted in decreases in crime. The EPA (2015a) has outlined many known adverse health effects of O_3, including respiratory symptoms like coughing, throat irritation, pain, burning or discomfort in that chest along with airway inflammation. These results suggested physical discomfort due to environmental factors could deter crimes because the potential offender is exhibiting uncomfortable symptoms. Nitrogen dioxide (NO_2) is also known to cause airway inflammation and other respiratory effects (EPA, 2015b). In the Chicago model, NO_2 concentration increases were found to have a relationship with decreases in crime. This was the opposite from what was observed in the Houston and Philadelphia models, however, the NO_2 concentrations in the present study's time period in Chicago were higher and increases from the 25th percentile to 75th percentile of concentration in Chicago likely approached the current EPA outdoor air quality standard of 53 ppb (annual mean) (EPA, 2015e).

The results for coarse, respirable particulate matter (PM_{10}) further suggested crimes decreased when outdoor air concentrations of pollutants causing irritation increased. PM_{10} is known to have an adverse respiratory effect, causing trouble breathing (EPA, 2015c). In 13 of 15 significant results, increases in PM_{10} resulted in decreases in crime. The results of the lag model suggested a spike in crimes after the first day of the concentration increase. Decreases in crime rates relating to outdoor air pollutants known to cause discomfort suggested irritation and/or discomfort could be relevant social/behavioral factors, which resulted in different decisions being made, thus reducing crime rates.

Unlike PM_{10}, higher outdoor air concentrations of fine particulate matter ($PM_{2.5}$) seemed to have an immediate impact on crime increases, with statistically significant findings resulting in an increase in crime when $PM_{2.5}$ concentrations increased from the 25th percentile to the 75th percentile. The difference between the two types of particulate matter may be in part due to the ability of $PM_{2.5}$ to penetrate deeper inside the lungs (EPA, 2015c); however, more research is necessary on neurological impacts of particulate matter. The concentrations of $PM_{2.5}$ observed throughout the study period suggested the significant increases in crime rates could be more apparent for these results because the observed concentrations in the 3rd-4th quartiles were more likely to exceed the current NAAQS.

Though sulfur dioxide (SO_2) is also known to cause respiratory problems like bronchoconstriction (EPA, 2015d), the results differed between models. In Chicago, statistically significant results were related to increases in crime, while in Seattle, statistically significant results were related to decreases in crime. Additional research is needed to understand how SO_2 may impact crime. The slight increases in SO_2 concentration observed in the winter season in Chicago, Houston and Philadelphia, suggests the role of home heating via fireplaces and/or other means, beyond electricity-generating coal-fired power plants, as sources affecting urban area outdoor air quality.

Additional studies are needed to understand the acute physiological relationships between outdoor air pollutants and central nervous system inflammation. As demonstrated by many studies relating to the pulmonary system, outdoor air pollutants can cause measurable increases in acute inflammation. Due to this, there could be an acute physiological relationship between outdoor air pollution, inflammation of the brain and crime that has not yet been identified. Future studies should also focus on locations with outdoor air pollution concentrations close to or exceeding the NAAQS to understand if locations with higher concentrations have similar findings. In addition, selecting locations with more government outdoor air monitoring stations, or supplementing with additional air monitoring equipment for research, will enhance future studies.

Studies should also focus on locations that can be analyzed by block or in specific sections to isolate demographic differences and incorporate more information on specific built environment attributes. This would allow for more refined indicators within each city to account for potential confounders not likely to change day over day but which may change within the city. Furthermore, differences in demographics and socio-economic status were observed between the study cities, with Seattle having higher educational attainment and median income. Focusing on differences in demographics within cities may help identify the impact of these differences to further understand if Seattle had fewer crimes because people with higher education made different decisions.

Overall, the outdoor or ambient environment can have an effect on a person's behaviors through physiological and psychological mechanisms. This study suggested psychological/behavioral relationships were also important to consider. Crime rates varied based on different physical conditions, which suggesting people may choose to commit a crime or to not commit a crime based on outdoor conditions. Though crime is the most measureable behavioral impact, it seems plausible these effects are happening everywhere. Future studies should consider looking at behavioral problems both outdoors and indoors, including schools and workplaces, along with measures of workplace stress and violence, to see if similar relationships are observed.

Limitations

This was an exploratory ecological study. The results can only be interpreted as observable associations, they do not establish causation. Though this study had specific crime data down to the time and location by day, it did not include an equivalent level of detail for outdoor air pollutant concentrations. Outdoor air pollutant information included daily averages mandated by existing regulations; therefore, any daily peaks in air pollution concentrations potentially resulting in a subsequent crime count not be identified. In addition, the PM_{10} and $PM_{2.5}$ data did not include information on adsorbed chemicals, particle bound polycyclic aromatic hydrocarbons—some of which are known, probable or possible human carcinogens—or chemical speciation data useful for source apportionment. Therefore, this study can only inform future studies based on the use of mass data, and additional information would be needed in future studies to identify causal relationships. Furthermore, due to the independent relationship between weather variables and air pollution, it is difficult to attribute crime to a one specific weather variable or air pollutant observation. This study was also limited to the air monitors within each city. In locations like Seattle, fewer monitors were available within city limits and may have contributed to differences in results between Seattle and the other study locations.

Crime data collection may vary between cities or within each city depending on reporting criteria used in local precincts. In addition, it is possible not every crime gets reported to local authorities. Therefore, the crime data in this study may have underreported values, and can only be used as a baseline indicator outlining the minimum number of known crimes for each location. Furthermore, geographical differences between and within locations were not considered. This includes differences in built environment and accessibility to alcohol and tobacco and the recreational built environment including green space. This study considered routine activities based on the Exposure Factors Handbook Activity Factors (USEPA, 2011). However, these factors were estimations and based on the entire city population demographics, not the behaviors of the person committing the crime or the affected person. Therefore, it was unclear what the activity patterns were relating to with regards to the specific location within the city where the crime was reported to have occurred. In addition, gang activity was not estimated and may be an unmeasurable source of information bias.

Conclusion

While evidence of biological plausibility supports how outdoor or ambient air pollution could be associated with increases in crime, most studies to date had focused specifically on the relationship between crime and outdoor air-lead concentrations. Few studies had considered other ambient air pollutants monitored by government air monitoring stations. Mechanisms underlying and describing decreased cognitive function in air-lead studies are emerging as researchers explore the possibility of similar damage potentially being caused from other types of air pollutants. This study was the first to look at multiple air pollutants in relation to daily crime data by city and to consider short-term environmental outdoor air pollution and weather/climate variables (estimated exposures) in relation to increased instances of violent and property crimes.

This study is novel and can contribute to several fields like environmental public health, criminal justice and public policy. In addition, these findings have substantiated much of the literature existing about temperature and crime while opening a new door to look at environmental air pollutants and their relationship on behaviors likely leading to crime. Further studies are needed to understand these relationships and make recommendations to reduce crime through improved understanding of environmental factors. Identifying more outdoor environmental factors potentially contributing to increases in reported crime would be significant to public health in the United States and a starting point for both policies and national, state and/or community-based programs aimed at reducing both environmental exposures and crime.

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Appendix A

Monitoring Station	Brigantine	Chester	East Orange	Elizabeth	Elizabeth Trailer	Ewing	Flemington	Jersey City	Jersey City Firehouse	Millville	South Camden	Rahway	Rider University	Rutgers University
Particulate Matter (PM2.5)					X	X			X	X	X	X		
Ozone (O3)	X	X					X			X			X	X
Carbon Monoxide (CO)			X	X	X			X						
Smoke				X	X			X						
Nitrogen Oxide (NO)		X	X		X					X				X
Nitrogen Dioxide (NO2)		X	X		X					X				X
Sulfur Dioxide (SO2)	X	X		X	X			X						

Appendix B

i. Chicago Air Monitoring Station Addresses

1. 327 South Franklin Street, Chicago, IL 60606, USA
2. 3372-3458 East Cheltenham Place, Chicago, IL 60649, USA
3. Samuel Kersten Junior Physics Teaching Center, The University of Chicago, Chicago, IL 60637, USA
4. Taft High School, 6530 West Bryn West Bryn Mawr Avenue, Chicago, IL 60631, USA
5. 7801 South Lawndale Avenue, Chicago, IL 60652, USA
6. 1713 North Springfield Avenue, Chicago, IL 60647, USA
7. 11441-11473 South Avenue O, Chicago, IL 60617, USA
8. Interstate 94, Chicago, IL 60607, USA
9. 4601-4651 North Lamon Avenue, Chicago, IL 60630, USA
10. Streeterville, Chicago, IL, USA

ii. Houston Air Monitoring Station Addresses

1. 6610 Malibu Drive, Houston, TX 77092, USA
2. 4538 Aldine Mail Route Road, Houston, TX 77039, USA
3. 139-199 Clinton Park Street, Houston, TX 77029, USA
4. 2412 Texas Street, Houston, TX 77003, USA
5. 7600 Kingsley Street, Houston, TX 77087, USA
6. Braeburn Street, Houston, TX 77074, USA
7. 1276-1282 Mae Drive, Houston, TX 77015, USA
8. 7901-7927 Lebate Street, Houston, TX 77028, USA
9. 13901-13953 Croquet Lane, Houston, TX 77085, USA
10. 8450 Almeda Genoa Road, Houston, TX 77075, USA
11. 7761-7865 Westglen Drive, Houston, TX 77063, USA

iii. Philadelphia Air Monitoring Station Addresses

1. US Army Reserve, 1501 East Lycoming Street, Philadelphia, PA 19124, USA
2. Baxter Trail, Philadelphia, PA 19136, USA
3. 2800-3290 Lewis Street, Philadelphia, PA 19137, USA
4. 1399 Lombard Street, Philadelphia, PA 19147, USA
5. Northeast Philadelphia Airport (PNE), 9998 Ashton Road, Philadelphia, PA 19114, USA
6. 420-454 Dearnley Street, Philadelphia, PA 19128, USA
7. 2365-2399 South 24th Street, Philadelphia, PA 19145, USA
8. Fort Mifflin Road, Philadelphia, PA 19153, USA
9. 200 Spring Garden Street, Philadelphia, PA 19123, USA
10. 3701-4099 North Delaware Avenue, Philadelphia, PA 19137, USA

iv. Seattle Air Monitoring Station Addresses

1. Shelter 1, Seattle, WA 98108, USA
2. 8025 10th Avenue South, Seattle, WA 98108, USA
3. 4730 Ohio Avenue South, Seattle, WA 98134, USA
4. 1624 Boren Avenue, Seattle, WA 98101, USA

Appendix C

Federal Holidays
New Year’s Day
Martin Luther King, Jr. Day
Washington’s Birthday (Presidents’ Day)
Independence Day
Labor Day
Columbus Day
Veterans Day
Thanksgiving Day
Christmas Day

(USA.gov, American Holidays, 2015. https://www.usa.gov/life-in-the-us)

Observances
Valentine’s Day
Easter Sunday
Mother’s Day
Father’s Day
Halloween
Christmas Eve
New Year’s Eve

Appendix D: Lag Calculation Summary

All Locations and Assault Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	2	0.0311	1.064	0.991	1.143	0.088
CO (lag 1)	2	0.0143	1.029	0.957	1.106	0.438
CO (lag 2)	2	0.0347	1.072	0.997	1.152	0.061
CO (lag 3)	2	0.0052	1.010	0.940	1.086	0.779
CO (lag 4)	2	0.0021	1.004	0.934	1.079	0.911
CO (lag 5)	2	0.0141	1.029	0.964	1.097	0.394
O_3	0.01749	0.0652	1.001	0.989	1.013	0.852
O_3 (lag 1)	0.01749	-0.110	0.998	0.986	1.011	0.766
O_3 (lag 2)	0.01749	-0.217	0.996	0.984	1.009	0.554
O_3 (lag 3)	0.01749	0.616	1.011	0.998	1.024	0.094
O_3 (lag 4)	0.01749	-0.347	0.994	0.982	1.006	0.342
O_3 (lag 5)	0.01749	0.0742	1.001	0.990	1.012	0.816
$PM_{2.5}$	6.525	0.0031	1.020	1.010	1.030	<.0001
$PM_{2.5}$ (lag 1)	6.525	0.001	1.007	0.997	1.016	0.181
$PM_{2.5}$ (lag 2)	6.525	0.0011	1.007	0.997	1.016	0.150
$PM_{2.5}$ (lag 3)	6.525	-0.0001	0.999	0.990	1.009	0.860
$PM_{2.5}$ (lag 4)	6.525	-0.0004	0.997	0.988	1.007	0.624
$PM_{2.5}$ (lag 5)	6.525	0.0004	1.003	0.995	1.010	0.544
SO_2	3.62	0.0005	1.002	0.995	1.008	0.603
SO_2 (lag 1)	3.62	-0.0003	0.999	0.993	1.005	0.689
SO_2 (lag 2)	3.62	0	1.000	0.994	1.006	0.966
SO_2 (lag 3)	3.62	-0.0005	0.998	0.992	1.004	0.564
SO_2 (lag 4)	3.62	0.0007	1.003	0.996	1.009	0.420
SO_2 (lag 5)	3.62	-0.0005	0.998	0.992	1.004	0.530

All Locations and Burglary Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	2	-0.082	0.849	0.762	0.946	0.003
CO (lag 1)	2	0.009	1.019	0.913	1.137	0.736
CO (lag 2)	2	-0.017	0.967	0.865	1.080	0.550
CO (lag 3)	2	-0.043	0.917	0.821	1.024	0.125
CO (lag 4)	2	-0.019	0.963	0.862	1.074	0.497
CO (lag 5)	2	-0.006	0.988	0.898	1.087	0.806
O_3	0.01749	-0.316	0.994	0.978	1.011	0.509
O_3 (lag 1)	0.01749	-0.156	0.997	0.980	1.015	0.763
O_3 (lag 2)	0.01749	0.085	1.001	0.984	1.020	0.871
O_3 (lag 3)	0.01749	0.081	1.001	0.984	1.020	0.878
O_3 (lag 4)	0.01749	0.427	1.007	0.990	1.026	0.409
O_3 (lag 5)	0.01749	0.143	1.003	0.988	1.018	0.742
$PM_{2.5}$	6.525	0.000	1.003	0.988	1.018	0.702
$PM_{2.5}$ (lag 1)	6.525	0.001	1.005	0.990	1.020	0.483
$PM_{2.5}$ (lag 2)	6.525	0.000	0.999	0.985	1.014	0.956
$PM_{2.5}$ (lag 3)	6.525	0.000	0.999	0.985	1.014	0.956
$PM_{2.5}$ (lag 4)	6.525	0.001	1.004	0.989	1.018	0.611
$PM_{2.5}$ (lag 5)	6.525	0.000	1.001	0.989	1.013	0.880
SO_2	3.62	0.000	1.001	0.992	1.010	0.857
SO_2 (lag 1)	3.62	0.000	0.999	0.989	1.008	0.746
SO_2 (lag 2)	3.62	0.001	1.003	0.994	1.012	0.526
SO_2 (lag 3)	3.62	0.001	1.002	0.993	1.011	0.665
SO_2 (lag 4)	3.62	0.001	1.005	0.996	1.015	0.266
SO_2 (lag 5)	3.62	0.000	1.000	0.991	1.009	0.952

All Locations and Homicide Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	2	0.0612	1.130	0.773	1.653	0.528
CO (lag 1)	2	0.0797	1.173	0.798	1.723	0.417
CO (lag 2)	2	0.0283	1.058	0.715	1.566	0.777
CO (lag 3)	2	0.02	1.041	0.708	1.530	0.839
CO (lag 4)	2	0.152	1.356	0.923	1.992	0.121
CO (lag 5)	2	-0.104	0.813	0.570	1.159	0.253
O_3	0.01749	1.088	1.019	0.958	1.085	0.550
O_3 (lag 1)	0.01749	1.738	1.031	0.966	1.100	0.358
O_3 (lag 2)	0.01749	-1.606	0.972	0.911	1.038	0.397
O_3 (lag 3)	0.01749	-2.083	0.964	0.903	1.029	0.275
O_3 (lag 4)	0.01749	-0.7811	0.986	0.924	1.053	0.681
O_3 (lag 5)	0.01749	-0.726	0.987	0.933	1.045	0.662
$PM_{2.5}$	6.525	-0.0012	0.992	0.942	1.045	0.771
$PM_{2.5}$ (lag 1)	6.525	0.0093	1.063	1.009	1.119	0.022
$PM_{2.5}$ (lag 2)	6.525	-0.0033	0.979	0.929	1.031	0.417
$PM_{2.5}$ (lag 3)	6.525	-0.0016	0.990	0.939	1.042	0.690
$PM_{2.5}$ (lag 4)	6.525	0.0063	1.042	0.990	1.097	0.117
$PM_{2.5}$ (lag 5)	6.525	-0.0024	0.984	0.942	1.029	0.492
SO_2	3.62	0.0062	1.023	0.987	1.059	0.210
SO_2 (lag 1)	3.62	0.0035	1.013	0.978	1.049	0.479
SO_2 (lag 2)	3.62	0.0095	1.035	1.000	1.071	0.049
SO_2 (lag 3)	3.62	-0.0066	0.976	0.942	1.013	0.200
SO_2 (lag 4)	3.62	0.0093	1.034	0.999	1.072	0.061
SO_2 (lag 5)	3.62	-0.0094	0.967	0.933	1.001	0.060

All Locations and Motor Vehicle Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	2	-0.0146	0.971	0.854	1.105	0.657
CO (lag 1)	2	-0.0242	0.953	0.835	1.087	0.473
CO (lag 2)	2	0.002	1.004	0.879	1.147	0.952
CO (lag 3)	2	-0.0472	0.910	0.797	1.039	0.164
CO (lag 4)	2	-0.0319	0.938	0.822	1.071	0.344
CO (lag 5)	2	-0.0321	0.938	0.835	1.053	0.278
O_3	0.01749	0.2347	1.004	0.984	1.025	0.691
O_3 (lag 1)	0.01749	0.2169	1.004	0.982	1.026	0.734
O_3 (lag 2)	0.01749	0.218	1.004	0.982	1.026	0.735
O_3 (lag 3)	0.01749	-0.262	0.995	0.974	1.018	0.685
O_3 (lag 4)	0.01749	0.1835	1.003	0.981	1.025	0.774
O_3 (lag 5)	0.01749	0.463	1.008	0.990	1.027	0.392
$PM_{2.5}$	6.525	0.0013	1.009	0.992	1.026	0.327
$PM_{2.5}$ (lag 1)	6.525	0.0014	1.009	0.992	1.028	0.313
$PM_{2.5}$ (lag 2)	6.525	0.0001	1.001	0.983	1.018	0.944
$PM_{2.5}$ (lag 3)	6.525	-0.0014	0.991	0.974	1.009	0.306
$PM_{2.5}$ (lag 4)	6.525	0.0014	1.009	0.992	1.027	0.290
$PM_{2.5}$ (lag 5)	6.525	-0.0004	0.997	0.983	1.012	0.702
SO_2	3.62	0.0024	1.009	0.997	1.020	0.132
SO_2 (lag 1)	3.62	-0.0002	0.999	0.988	1.010	0.873
SO_2 (lag 2)	3.62	0.0011	1.004	0.993	1.015	0.463
SO_2 (lag 3)	3.62	0.0006	1.002	0.991	1.013	0.679
SO_2 (lag 4)	3.62	-0.0017	0.994	0.983	1.005	0.279
SO_2 (lag 5)	3.62	-0.0007	0.997	0.987	1.008	0.663

All Locations and Robbery Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	2	0.0018	1.004	0.907	1.110	0.944
CO (lag 1)	2	0.0327	1.068	0.963	1.183	0.212
CO (lag 2)	2	0.0184	1.037	0.935	1.151	0.488
CO (lag 3)	2	-0.0277	0.946	0.854	1.049	0.292
CO (lag 4)	2	0.0198	1.040	0.939	1.153	0.447
CO (lag 5)	2	0.0232	1.047	0.957	1.146	0.314
O_3	0.01749	-1.856	0.968	0.952	0.984	0.000
O_3 (lag 1)	0.01749	-0.0185	1.000	0.982	1.017	0.971
O_3 (lag 2)	0.01749	-0.5267	0.991	0.974	1.008	0.301
O_3 (lag 3)	0.01749	-0.5711	0.990	0.973	1.008	0.264
O_3 (lag 4)	0.01749	0.3705	1.007	0.989	1.024	0.464
O_3 (lag 5)	0.01749	-0.4566	0.992	0.977	1.007	0.293
$PM_{2.5}$	6.525	-0.0006	0.996	0.983	1.010	0.608
$PM_{2.5}$ (lag 1)	6.525	0.0005	1.003	0.990	1.018	0.646
$PM_{2.5}$ (lag 2)	6.525	0.001	1.007	0.993	1.021	0.338
$PM_{2.5}$ (lag 3)	6.525	-0.0013	0.992	0.977	1.005	0.216
$PM_{2.5}$ (lag 4)	6.525	0.0006	1.004	0.990	1.018	0.566
$PM_{2.5}$ (lag 5)	6.525	-0.0003	0.998	0.986	1.010	0.748
SO_2	3.62	0.0012	1.004	0.995	1.014	0.339
SO_2 (lag 1)	3.62	0.0005	1.002	0.993	1.011	0.708
SO_2 (lag 2)	3.62	0.0014	1.005	0.996	1.015	0.261
SO_2 (lag 3)	3.62	0.001	1.004	0.994	1.013	0.459
SO_2 (lag 4)	3.62	0.0006	1.002	0.993	1.011	0.667
SO_2 (lag 5)	3.62	0.0025	1.009	1.000	1.018	0.044

All Locations and Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	2	-0.1517	0.738	0.673	0.810	<.0001
CO (lag 1)	2	-0.0257	0.950	0.865	1.044	0.284
CO (lag 2)	2	-0.0402	0.923	0.839	1.015	0.098
CO (lag 3)	2	-0.0474	0.910	0.828	0.999	0.048
CO (lag 4)	2	-0.0163	0.968	0.881	1.063	0.497
CO (lag 5)	2	-0.0658	0.877	0.807	0.952	0.002
O_3	0.01749	-0.705	0.988	0.974	1.002	0.082
O_3 (lag 1)	0.01749	-0.6161	0.989	0.975	1.004	0.157
O_3 (lag 2)	0.01749	0.4843	1.009	0.993	1.024	0.269
O_3 (lag 3)	0.01749	0.0061	1.000	0.985	1.015	0.989
O_3 (lag 4)	0.01749	-0.2566	0.996	0.981	1.010	0.555
O_3 (lag 5)	0.01749	0.382	1.007	0.994	1.020	0.300
$PM_{2.5}$	6.525	0.0017	1.011	0.999	1.024	0.079
$PM_{2.5}$ (lag 1)	6.525	0.0011	1.007	0.994	1.020	0.283
$PM_{2.5}$ (lag 2)	6.525	-0.0002	0.999	0.986	1.011	0.839
$PM_{2.5}$ (lag 3)	6.525	-0.0005	0.997	0.984	1.009	0.575
$PM_{2.5}$ (lag 4)	6.525	0.0008	1.005	0.993	1.018	0.383
$PM_{2.5}$ (lag 5)	6.525	-0.0007	0.995	0.985	1.006	0.373
SO_2	3.62	-0.823	0.051	0.005	0.540	0.014
SO_2 (lag 1)	3.62	0.0003	1.001	0.993	1.009	0.800
SO_2 (lag 2)	3.62	-0.0002	0.999	0.991	1.007	0.826
SO_2 (lag 3)	3.62	-0.0005	0.998	0.991	1.006	0.684
SO_2 (lag 4)	3.62	0.0005	1.002	0.994	1.010	0.640
SO_2 (lag 5)	3.62	-0.0018	0.994	0.986	1.001	0.101

Chicago and Arson & Burning Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	0.1135	1.406	0.535	3.693	0.490
CO (lag 1)	3	-0.1516	0.635	0.247	1.629	0.344
CO (lag 2)	3	0.1644	1.638	0.657	4.084	0.290
CO (lag 3)	3	0.338	2.757	1.117	6.801	0.028
CO (lag 4)	3	-0.1763	0.589	0.232	1.496	0.266
CO (lag 5)	3	0.0569	1.186	0.511	2.752	0.691
O_3	0.0214	6.5845	1.151	1.004	1.320	0.044
O_3 (lag 1)	0.0214	-5.4095	0.891	0.774	1.025	0.107
O_3 (lag 2)	0.0214	-2.4062	0.950	0.829	1.089	0.460
O_3 (lag 3)	0.0214	2.8023	1.062	0.927	1.217	0.388
O_3 (lag 4)	0.0214	1.257	1.027	0.897	1.176	0.697
O_3 (lag 5)	0.0214	3.1537	1.070	0.950	1.205	0.266
$PM_{2.5}$	7.175	0.0136	1.102	1.000	1.216	0.051
$PM_{2.5}$ (lag 1)	7.175	-0.0052	0.963	0.880	1.054	0.415
$PM_{2.5}$ (lag 2)	7.175	0.0008	1.006	0.921	1.098	0.897
$PM_{2.5}$ (lag 3)	7.175	0.0046	1.034	0.948	1.127	0.459
$PM_{2.5}$ (lag 4)	7.175	-0.0113	0.922	0.845	1.006	0.067
$PM_{2.5}$ (lag 5)	7.175	0.0019	1.014	0.943	1.089	0.714
SO_2	4	0.0063	1.026	0.965	1.090	0.417
SO_2 (lag 1)	4	0.0059	1.024	0.967	1.085	0.419
SO_2 (lag 2)	4	0.0056	1.023	0.965	1.084	0.451
SO_2 (lag 3)	4	0.0089	1.036	0.978	1.098	0.228
SO_2 (lag 4)	4	0	1.000	0.943	1.061	0.997
SO_2 (lag 5)	4	-0.0054	0.979	0.922	1.038	0.475
NO_2	15.6333	-0.002	0.969	0.874	1.073	0.543
NO_2 (lag 1)	15.6333	-0.0009	0.986	0.902	1.078	0.749
NO_2 (lag 2)	15.6333	0.0009	1.014	0.929	1.105	0.757
NO_2 (lag 3)	15.6333	-0.0042	0.936	0.859	1.021	0.137
NO_2 (lag 4)	15.6333	0.0059	1.097	1.008	1.195	0.032
NO_2 (lag 5)	15.6333	0.0019	1.030	0.954	1.112	0.453
PM_{10}	16.5	-0.0046	0.927	0.845	1.015	0.098
PM_{10} (lag 1)	16.5	-0.0049	0.922	0.855	0.995	0.037
PM_{10} (lag 2)	16.5	-0.0004	0.993	0.927	1.065	0.860
PM_{10} (lag 3)	16.5	0.0012	1.020	0.952	1.093	0.581
PM_{10} (lag 4)	16.5	-0.0029	0.953	0.887	1.025	0.200
PM_{10} (lag 5)	16.5	-0.0002	0.997	0.933	1.066	0.933

Chicago and Assault Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	0.0669	1.222	1.066	1.402	0.004
CO (lag 1)	3	0.0516	1.167	1.022	1.333	0.022
CO (lag 2)	3	0.0638	1.211	1.062	1.382	0.004
CO (lag 3)	3	0.0354	1.112	0.974	1.269	0.116
CO (lag 4)	3	0.0204	1.063	0.932	1.212	0.361
CO (lag 5)	3	0.053	1.172	1.040	1.321	0.009
O_3	0.021	0.7438	1.016	0.996	1.037	0.120
O_3 (lag 1)	0.021	-0.2318	0.995	0.975	1.016	0.633
O_3 (lag 2)	0.021	0.2019	1.004	0.985	1.025	0.670
O_3 (lag 3)	0.021	0.6026	1.013	0.993	1.034	0.208
O_3 (lag 4)	0.021	-0.2772	0.994	0.975	1.014	0.558
O_3 (lag 5)	0.021	0.3779	1.008	0.991	1.026	0.364
$PM_{2.5}$	7.18	0.0053	1.039	1.024	1.054	<.0001
$PM_{2.5}$ (lag 1)	7.18	0.0007	1.005	0.992	1.018	0.443
$PM_{2.5}$ (lag 2)	7.18	0.0011	1.008	0.995	1.021	0.228
$PM_{2.5}$ (lag 3)	7.18	-0.0002	0.999	0.986	1.011	0.798
$PM_{2.5}$ (lag 4)	7.18	-0.0008	0.994	0.982	1.006	0.351
$PM_{2.5}$ (lag 5)	7.18	0.0007	1.005	0.994	1.016	0.357
SO_2	4	0.0008	1.003	0.994	1.012	0.487
SO_2 (lag 1)	4	-0.0008	0.997	0.988	1.006	0.475
SO_2 (lag 2)	4	0.0003	1.001	0.992	1.010	0.807
SO_2 (lag 3)	4	-0.0008	0.997	0.988	1.006	0.482
SO_2 (lag 4)	4	0.0008	1.003	0.994	1.012	0.497
SO_2 (lag 5)	4	-0.0002	0.999	0.990	1.008	0.828
NO_2	15.63	0	1.000	0.984	1.014	0.989
NO_2 (lag 1)	15.63	-0.0004	0.994	0.981	1.008	0.401
NO_2 (lag 2)	15.63	0.0011	1.017	1.005	1.030	0.007
NO_2 (lag 3)	15.63	0.0004	1.006	0.994	1.019	0.369
NO_2 (lag 4)	15.63	0.0001	1.002	0.989	1.014	0.765
NO_2 (lag 5)	15.63	0.0007	1.011	0.998	1.022	0.073
PM_{10}	16.5	-0.0016	0.974	0.961	0.985	<.0001
PM_{10} (lag 1)	16.5	-0.0008	0.987	0.977	0.998	0.018
PM_{10} (lag 2)	16.5	-0.0004	0.993	0.984	1.003	0.172
PM_{10} (lag 3)	16.5	-0.0004	0.993	0.984	1.003	0.233
PM_{10} (lag 4)	16.5	-0.0006	0.990	0.979	1.000	0.053
PM_{10} (lag 5)	16.5	-0.0004	0.993	0.984	1.003	0.185

Chicago and Burglary Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	0.1037	1.365	1.134	1.643	0.001
CO (lag 1)	3	0.1181	1.425	1.191	1.705	0.0001
CO (lag 2)	3	0.0444	1.142	0.955	1.367	0.145
CO (lag 3)	3	0.0712	1.238	1.035	1.481	0.020
CO (lag 4)	3	0.026	1.081	0.904	1.293	0.393
CO (lag 5)	3	0.1577	1.605	1.364	1.888	<.0001
O_3	0.021	0.1087	1.002	0.975	1.031	0.871
O_3 (lag 1)	0.021	-0.3609	0.992	0.964	1.021	0.600
O_3 (lag 2)	0.021	-0.0427	0.999	0.971	1.028	0.950
O_3 (lag 3)	0.021	-0.3016	0.994	0.966	1.022	0.656
O_3 (lag 4)	0.021	0.2691	1.006	0.978	1.034	0.687
O_3 (lag 5)	0.021	0.4485	1.010	0.985	1.035	0.440
$PM_{2.5}$	7.18	0.0019	1.014	0.993	1.034	0.198
$PM_{2.5}$ (lag 1)	7.18	-0.0004	0.997	0.979	1.016	0.778
$PM_{2.5}$ (lag 2)	7.18	0.0001	1.001	0.983	1.019	0.928
$PM_{2.5}$ (lag 3)	7.18	0.0003	1.002	0.984	1.020	0.818
$PM_{2.5}$ (lag 4)	7.18	-0.0001	0.999	0.982	1.017	0.959
$PM_{2.5}$ (lag 5)	7.18	0.0015	1.011	0.996	1.025	0.150
SO_2	4	0.0043	1.017	1.005	1.030	0.006
SO_2 (lag 1)	4	0.0034	1.014	1.002	1.026	0.025
SO_2 (lag 2)	4	0.0055	1.022	1.010	1.034	0.0002
SO_2 (lag 3)	4	0.0041	1.017	1.005	1.028	0.005
SO_2 (lag 4)	4	0.0051	1.021	1.009	1.032	0.001
SO_2 (lag 5)	4	0.0042	1.017	1.006	1.028	0.003
NO_2	15.63	-0.0019	0.971	0.951	0.992	0.006
NO_2 (lag 1)	15.63	0.0001	1.002	0.983	1.019	0.927
NO_2 (lag 2)	15.63	0.0006	1.009	0.992	1.027	0.306
NO_2 (lag 3)	15.63	-0.0001	0.998	0.981	1.017	0.887
NO_2 (lag 4)	15.63	0.0007	1.011	0.994	1.029	0.204
NO_2 (lag 5)	15.63	0.0006	1.009	0.994	1.025	0.217
PM_{10}	16.5	-0.0029	0.953	0.938	0.971	<.0001
PM_{10} (lag 1)	16.5	-0.0018	0.971	0.956	0.985	0.0001
PM_{10} (lag 2)	16.5	-0.001	0.984	0.971	0.998	0.031
PM_{10} (lag 3)	16.5	-0.0011	0.982	0.968	0.995	0.011
PM_{10} (lag 4)	16.5	0.0001	1.002	0.987	1.017	0.841
PM_{10} (lag 5)	16.5	-0.0004	0.993	0.980	1.008	0.372

Chicago and Damage Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	0.1201	1.434	1.185	1.735	0.0002
CO (lag 1)	3	0.1079	1.382	1.149	1.662	0.0006
CO (lag 2)	3	0.0483	1.156	0.961	1.390	0.124
CO (lag 3)	3	0.0708	1.237	1.029	1.487	0.024
CO (lag 4)	3	0.0347	1.110	0.924	1.333	0.265
CO (lag 5)	3	0.086	1.294	1.096	1.528	0.002
O_3	0.021	0.0035	1.000	0.972	1.029	0.996
O_3 (lag 1)	0.021	-0.0427	0.999	0.970	1.029	0.951
O_3 (lag 2)	0.021	-0.9553	0.980	0.952	1.008	0.159
O_3 (lag 3)	0.021	-0.2985	0.994	0.966	1.023	0.662
O_3 (lag 4)	0.021	0.6495	1.014	0.986	1.043	0.336
O_3 (lag 5)	0.021	-0.207	0.996	0.971	1.021	0.728
$PM_{2.5}$	7.18	0.0048	1.035	1.014	1.056	0.001
$PM_{2.5}$ (lag 1)	7.18	0.0006	1.004	0.986	1.023	0.637
$PM_{2.5}$ (lag 2)	7.18	0.0001	1.001	0.983	1.020	0.921
$PM_{2.5}$ (lag 3)	7.18	-0.0003	0.998	0.980	1.017	0.840
$PM_{2.5}$ (lag 4)	7.18	-0.0003	0.998	0.980	1.016	0.843
$PM_{2.5}$ (lag 5)	7.18	-0.0007	0.995	0.980	1.010	0.496
SO_2	4	-0.0016	0.994	0.981	1.006	0.325
SO_2 (lag 1)	4	0.0008	1.003	0.991	1.016	0.608
SO_2 (lag 2)	4	0.0009	1.004	0.991	1.016	0.561
SO_2 (lag 3)	4	-0.0005	0.998	0.986	1.010	0.727
SO_2 (lag 4)	4	0.002	1.008	0.996	1.021	0.189
SO_2 (lag 5)	4	-0.0017	0.993	0.981	1.005	0.260
NO_2	15.63	-0.0003	0.995	0.974	1.016	0.653
NO_2 (lag 1)	15.63	-0.0001	0.998	0.980	1.017	0.841
NO_2 (lag 2)	15.63	0.0007	1.011	0.992	1.029	0.257
NO_2 (lag 3)	15.63	0.0004	1.006	0.989	1.025	0.457
NO_2 (lag 4)	15.63	0.0009	1.014	0.997	1.032	0.115
NO_2 (lag 5)	15.63	0.0002	1.003	0.988	1.019	0.646
PM_{10}	16.5	-0.0033	0.947	0.930	0.964	<.0001
PM_{10} (lag 1)	16.5	-0.0014	0.977	0.963	0.992	0.002
PM_{10} (lag 2)	16.5	-0.0013	0.979	0.964	0.992	0.002
PM_{10} (lag 3)	16.5	-0.001	0.984	0.969	0.997	0.019
PM_{10} (lag 4)	16.5	-0.0003	0.995	0.980	1.010	0.539
PM_{10} (lag 5)	16.5	-0.0019	0.969	0.955	0.982	<.0001

Chicago and Homicide Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	-0.0802	0.786	0.274	2.254	0.654
CO (lag 1)	3	0.0688	1.229	0.450	3.356	0.687
CO (lag 2)	3	0.1246	1.453	0.537	3.931	0.462
CO (lag 3)	3	0.0639	1.211	0.450	3.259	0.704
CO (lag 4)	3	0.137	1.508	0.565	4.030	0.413
CO (lag 5)	3	-0.237	0.491	0.195	1.238	0.132
O_3	0.021	1.9038	1.042	0.901	1.204	0.581
O_3 (lag 1)	0.021	1.7052	1.037	0.897	1.200	0.623
O_3 (lag 2)	0.021	-1.6961	0.964	0.836	1.113	0.619
O_3 (lag 3)	0.021	-5.9502	0.880	0.761	1.019	0.088
O_3 (lag 4)	0.021	-0.4521	0.990	0.858	1.144	0.895
O_3 (lag 5)	0.021	-6.1936	0.876	0.771	0.995	0.042
$PM_{2.5}$	7.18	-0.0046	0.968	0.871	1.074	0.537
$PM_{2.5}$ (lag 1)	7.18	0.0053	1.039	0.943	1.144	0.444
$PM_{2.5}$ (lag 2)	7.18	0.0066	1.048	0.952	1.154	0.336
$PM_{2.5}$ (lag 3)	7.18	-0.0142	0.903	0.820	0.994	0.037
$PM_{2.5}$ (lag 4)	7.18	0.0102	1.076	0.980	1.181	0.125
$PM_{2.5}$ (lag 5)	7.18	-0.0053	0.963	0.889	1.042	0.353
SO_2	4	0.0032	1.013	0.947	1.083	0.705
SO_2 (lag 1)	4	0.0061	1.025	0.963	1.091	0.440
SO_2 (lag 2)	4	0.0022	1.009	0.948	1.073	0.781
SO_2 (lag 3)	4	-0.0163	0.937	0.876	1.002	0.056
SO_2 (lag 4)	4	0.0239	1.100	1.037	1.168	0.002
SO_2 (lag 5)	4	-0.0083	0.967	0.907	1.031	0.305
NO_2	15.63	-0.0006	0.991	0.888	1.105	0.862
NO_2 (lag 1)	15.63	0.0019	1.030	0.935	1.135	0.550
NO_2 (lag 2)	15.63	-0.0005	0.992	0.903	1.090	0.864
NO_2 (lag 3)	15.63	-0.0013	0.980	0.894	1.075	0.662
NO_2 (lag 4)	15.63	0.0016	1.025	0.936	1.124	0.583
NO_2 (lag 5)	15.63	-0.0049	0.926	0.853	1.006	0.072
PM_{10}	16.5	0.0034	1.058	0.964	1.160	0.231
PM_{10} (lag 1)	16.5	0.0046	1.079	1.000	1.164	0.049
PM_{10} (lag 2)	16.5	-0.0011	0.982	0.912	1.058	0.625
PM_{10} (lag 3)	16.5	-0.0001	0.998	0.928	1.074	0.972
PM_{10} (lag 4)	16.5	-0.0001	0.998	0.925	1.075	0.950
PM_{10} (lag 5)	16.5	-0.0012	0.980	0.913	1.052	0.579

Chicago and Interference with a Public Officer Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	-0.0086	0.975	0.452	2.101	0.948
CO (lag 1)	3	-0.4805	0.237	0.109	0.511	0.0002
CO (lag 2)	3	-0.1437	0.650	0.306	1.380	0.262
CO (lag 3)	3	-0.0667	0.819	0.391	1.715	0.596
CO (lag 4)	3	0.0743	1.250	0.605	2.582	0.547
CO (lag 5)	3	-0.2118	0.530	0.270	1.039	0.064
O_3	0.021	0.8202	1.018	0.917	1.130	0.743
O_3 (lag 1)	0.021	-3.1274	0.935	0.841	1.040	0.217
O_3 (lag 2)	0.021	0.5355	1.012	0.913	1.121	0.827
O_3 (lag 3)	0.021	2.7855	1.061	0.957	1.178	0.261
O_3 (lag 4)	0.021	2.4645	1.054	0.951	1.168	0.315
O_3 (lag 5)	0.021	-1.7079	0.964	0.880	1.056	0.430
$PM_{2.5}$	7.18	0.0032	1.023	0.948	1.104	0.559
$PM_{2.5}$ (lag 1)	7.18	-0.0071	0.950	0.885	1.020	0.162
$PM_{2.5}$ (lag 2)	7.18	-0.001	0.993	0.927	1.064	0.845
$PM_{2.5}$ (lag 3)	7.18	0.003	1.022	0.955	1.094	0.527
$PM_{2.5}$ (lag 4)	7.18	0.0021	1.015	0.948	1.086	0.667
$PM_{2.5}$ (lag 5)	7.18	-0.0051	0.964	0.910	1.021	0.208
SO_2	4	0.0132	1.054	1.006	1.105	0.029
SO_2 (lag 1)	4	0.0001	1.000	0.955	1.048	0.983
SO_2 (lag 2)	4	0.0012	1.005	0.960	1.052	0.835
SO_2 (lag 3)	4	0.0008	1.003	0.958	1.050	0.890
SO_2 (lag 4)	4	0.0059	1.024	0.978	1.071	0.311
SO_2 (lag 5)	4	0.0006	1.002	0.958	1.049	0.912
NO_2	15.63	-0.0016	0.975	0.901	1.056	0.533
NO_2 (lag 1)	15.63	-0.0046	0.931	0.869	0.998	0.045
NO_2 (lag 2)	15.63	-0.0015	0.977	0.913	1.046	0.509
NO_2 (lag 3)	15.63	0.001	1.016	0.950	1.086	0.654
NO_2 (lag 4)	15.63	-0.0003	0.995	0.931	1.063	0.877
NO_2 (lag 5)	15.63	0.0005	1.008	0.948	1.070	0.815
PM_{10}	16.5	0.0031	1.052	0.987	1.124	0.119
PM_{10} (lag 1)	16.5	0.0021	1.035	0.979	1.095	0.223
PM_{10} (lag 2)	16.5	-0.0001	0.998	0.947	1.052	0.958
PM_{10} (lag 3)	16.5	0.0045	1.077	1.022	1.134	0.005
PM_{10} (lag 4)	16.5	0.0023	1.039	0.984	1.097	0.166
PM_{10} (lag 5)	16.5	-0.0011	0.982	0.933	1.034	0.493

Chicago and Motor Vehicle Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	0.1476	1.557	1.224	1.982	0.0003
CO (lag 1)	3	0.002	1.006	0.794	1.274	0.961
CO (lag 2)	3	0.0445	1.143	0.904	1.445	0.264
CO (lag 3)	3	0.0369	1.117	0.883	1.413	0.355
CO (lag 4)	3	-0.0214	0.938	0.742	1.186	0.593
CO (lag 5)	3	0.0402	1.128	0.910	1.398	0.270
O_3	0.021	0.8847	1.019	0.984	1.056	0.295
O_3 (lag 1)	0.021	0.5779	1.012	0.976	1.050	0.506
O_3 (lag 2)	0.021	0.6666	1.014	0.979	1.051	0.434
O_3 (lag 3)	0.021	-0.5076	0.989	0.954	1.025	0.554
O_3 (lag 4)	0.021	0.0018	1.000	0.965	1.036	0.998
O_3 (lag 5)	0.021	1.3432	1.029	0.998	1.062	0.069
$PM_{2.5}$	7.18	0.0029	1.021	0.996	1.047	0.103
$PM_{2.5}$ (lag 1)	7.18	-0.0003	0.998	0.976	1.021	0.857
$PM_{2.5}$ (lag 2)	7.18	0.0016	1.012	0.990	1.034	0.298
$PM_{2.5}$ (lag 3)	7.18	-0.0012	0.991	0.970	1.014	0.443
$PM_{2.5}$ (lag 4)	7.18	-0.0001	0.999	0.977	1.021	0.944
$PM_{2.5}$ (lag 5)	7.18	-0.0001	0.999	0.982	1.017	0.933
SO_2	4	0.0095	1.039	1.023	1.055	<.0001
SO_2 (lag 1)	4	0.0028	1.011	0.996	1.026	0.144
SO_2 (lag 2)	4	0.006	1.024	1.009	1.040	0.002
SO_2 (lag 3)	4	0.0042	1.017	1.002	1.032	0.026
SO_2 (lag 4)	4	0.0011	1.004	0.990	1.019	0.554
SO_2 (lag 5)	4	0.004	1.016	1.002	1.031	0.030
NO_2	15.63	-0.0022	0.966	0.941	0.992	0.009
NO_2 (lag 1)	15.63	-0.0006	0.991	0.968	1.013	0.410
NO_2 (lag 2)	15.63	0.0005	1.008	0.986	1.032	0.459
NO_2 (lag 3)	15.63	0.0003	1.005	0.983	1.027	0.669
NO_2 (lag 4)	15.63	-0.0006	0.991	0.969	1.013	0.412
NO_2 (lag 5)	15.63	-0.0007	0.989	0.969	1.008	0.248
PM_{10}	16.5	-0.0017	0.972	0.950	0.993	0.014
PM_{10} (lag 1)	16.5	-0.0007	0.989	0.971	1.008	0.239
PM_{10} (lag 2)	16.5	0.0004	1.007	0.989	1.025	0.460
PM_{10} (lag 3)	16.5	-0.0012	0.980	0.963	0.998	0.039
PM_{10} (lag 4)	16.5	0.0001	1.002	0.984	1.022	0.827
PM_{10} (lag 5)	16.5	-0.0002	0.997	0.979	1.015	0.693

Chicago and Rape & Sex Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	-0.0315	0.910	0.487	1.698	0.766
CO (lag 1)	3	0.0706	1.236	0.678	2.253	0.489
CO (lag 2)	3	-0.0001	1.000	0.549	1.819	0.999
CO (lag 3)	3	0.0603	1.198	0.662	2.168	0.550
CO (lag 4)	3	0.1174	1.422	0.792	2.556	0.239
CO (lag 5)	3	-0.0357	0.898	0.522	1.545	0.699
O_3	0.021	0.0367	1.001	0.915	1.094	0.986
O_3 (lag 1)	0.021	0.7039	1.015	0.928	1.111	0.744
O_3 (lag 2)	0.021	0.6367	1.014	0.928	1.107	0.762
O_3 (lag 3)	0.021	0.6222	1.013	0.927	1.108	0.770
O_3 (lag 4)	0.021	-2.3669	0.951	0.870	1.038	0.261
O_3 (lag 5)	0.021	1.5001	1.033	0.955	1.116	0.420
$PM_{2.5}$	7.18	0.0007	1.005	0.944	1.071	0.869
$PM_{2.5}$ (lag 1)	7.18	-0.0021	0.985	0.929	1.044	0.611
$PM_{2.5}$ (lag 2)	7.18	0.0072	1.053	0.995	1.115	0.074
$PM_{2.5}$ (lag 3)	7.18	-0.0083	0.942	0.890	0.998	0.041
$PM_{2.5}$ (lag 4)	7.18	-0.0007	0.995	0.940	1.053	0.865
$PM_{2.5}$ (lag 5)	7.18	0	1.000	0.954	1.048	0.991
SO_2	4	-0.0028	0.989	0.949	1.031	0.597
SO_2 (lag 1)	4	-0.0016	0.994	0.956	1.033	0.755
SO_2 (lag 2)	4	0.0031	1.012	0.974	1.052	0.528
SO_2 (lag 3)	4	0.0011	1.004	0.967	1.044	0.819
SO_2 (lag 4)	4	0.0179	1.074	1.036	1.114	<.0001
SO_2 (lag 5)	4	-0.003	0.988	0.952	1.026	0.535
NO_2	15.63	-0.0011	0.983	0.920	1.051	0.619
NO_2 (lag 1)	15.63	0	1.000	0.944	1.060	0.983
NO_2 (lag 2)	15.63	-0.0018	0.972	0.919	1.029	0.323
NO_2 (lag 3)	15.63	0.0009	1.014	0.959	1.071	0.629
NO_2 (lag 4)	15.63	0.0011	1.017	0.963	1.076	0.528
NO_2 (lag 5)	15.63	-0.0021	0.968	0.920	1.017	0.203
PM_{10}	16.5	-0.0003	0.995	0.939	1.054	0.868
PM_{10} (lag 1)	16.5	-0.0008	0.987	0.941	1.035	0.601
PM_{10} (lag 2)	16.5	0.0006	1.010	0.966	1.058	0.652
PM_{10} (lag 3)	16.5	-0.0008	0.987	0.942	1.032	0.558
PM_{10} (lag 4)	16.5	-0.0012	0.980	0.936	1.027	0.413
PM_{10} (lag 5)	16.5	-0.0021	0.966	0.924	1.008	0.116

Chicago and Robbery Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	0.0907	1.313	1.050	1.642	0.017
CO (lag 1)	3	0.0798	1.270	1.022	1.580	0.031
CO (lag 2)	3	0.0395	1.126	0.905	1.401	0.288
CO (lag 3)	3	-0.0282	0.919	0.738	1.144	0.450
CO (lag 4)	3	0.0733	1.246	1.004	1.547	0.046
CO (lag 5)	3	0.0691	1.230	1.010	1.499	0.040
O_3	0.021	-1.3162	0.972	0.941	1.005	0.094
O_3 (lag 1)	0.021	-0.8758	0.981	0.949	1.015	0.275
O_3 (lag 2)	0.021	0.1457	1.003	0.971	1.037	0.853
O_3 (lag 3)	0.021	-1.1412	0.976	0.944	1.009	0.149
O_3 (lag 4)	0.021	0.4754	1.010	0.978	1.044	0.542
O_3 (lag 5)	0.021	0.2389	1.005	0.977	1.034	0.727
$PM_{2.5}$	7.18	0.0005	1.004	0.980	1.027	0.782
$PM_{2.5}$ (lag 1)	7.18	-0.0015	0.989	0.968	1.010	0.308
$PM_{2.5}$ (lag 2)	7.18	0.0029	1.021	1.000	1.042	0.054
$PM_{2.5}$ (lag 3)	7.18	-0.0019	0.986	0.966	1.007	0.206
$PM_{2.5}$ (lag 4)	7.18	0.0002	1.001	0.981	1.022	0.901
$PM_{2.5}$ (lag 5)	7.18	0.0008	1.006	0.989	1.023	0.490
SO_2	4	0.0025	1.010	0.996	1.025	0.177
SO_2 (lag 1)	4	-0.0002	0.999	0.985	1.013	0.923
SO_2 (lag 2)	4	0.0037	1.015	1.001	1.029	0.040
SO_2 (lag 3)	4	0.0009	1.004	0.990	1.017	0.625
SO_2 (lag 4)	4	0.0018	1.007	0.994	1.021	0.303
SO_2 (lag 5)	4	0.0041	1.017	1.003	1.030	0.016
NO_2	15.63	-0.0004	0.994	0.971	1.019	0.631
NO_2 (lag 1)	15.63	0.0007	1.011	0.991	1.033	0.301
NO_2 (lag 2)	15.63	0.0004	1.006	0.986	1.027	0.551
NO_2 (lag 3)	15.63	-0.0007	0.989	0.969	1.009	0.312
NO_2 (lag 4)	15.63	0.0014	1.022	1.002	1.043	0.038
NO_2 (lag 5)	15.63	0.0007	1.011	0.992	1.029	0.265
PM_{10}	16.5	-0.0009	0.985	0.964	1.007	0.173
PM_{10} (lag 1)	16.5	-0.0007	0.989	0.971	1.007	0.205
PM_{10} (lag 2)	16.5	-0.0008	0.987	0.971	1.003	0.122
PM_{10} (lag 3)	16.5	-0.0009	0.985	0.969	1.003	0.102
PM_{10} (lag 4)	16.5	0.0007	1.012	0.995	1.028	0.181
PM_{10} (lag 5)	16.5	-0.0003	0.995	0.979	1.010	0.494

Chicago and Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	0.0004	1.001	0.883	1.135	0.986
CO (lag 1)	3	0.0264	1.082	0.959	1.222	0.200
CO (lag 2)	3	0.0188	1.058	0.938	1.194	0.360
CO (lag 3)	3	0.0189	1.058	0.938	1.194	0.356
CO (lag 4)	3	0.0217	1.067	0.947	1.203	0.285
CO (lag 5)	3	0.0038	1.011	0.907	1.129	0.837
O_3	0.021	-0.4737	0.990	0.972	1.008	0.278
O_3 (lag 1)	0.021	-0.9743	0.979	0.961	0.998	0.029
O_3 (lag 2)	0.021	0.7323	1.016	0.997	1.035	0.093
O_3 (lag 3)	0.021	-0.4941	0.989	0.971	1.008	0.260
O_3 (lag 4)	0.021	-0.3787	0.992	0.974	1.010	0.382
O_3 (lag 5)	0.021	0.7968	1.017	1.001	1.033	0.035
$PM_{2.5}$	7.18	0.0008	1.006	0.992	1.019	0.410
$PM_{2.5}$ (lag 1)	7.18	0	1.000	0.989	1.012	0.960
$PM_{2.5}$ (lag 2)	7.18	0.0006	1.004	0.992	1.016	0.507
$PM_{2.5}$ (lag 3)	7.18	-0.0001	0.999	0.988	1.011	0.905
$PM_{2.5}$ (lag 4)	7.18	-0.0005	0.996	0.985	1.008	0.570
$PM_{2.5}$ (lag 5)	7.18	-0.0003	0.998	0.989	1.008	0.715
SO_2	4	0.0015	1.006	0.998	1.015	0.155
SO_2 (lag 1)	4	-0.0002	0.999	0.991	1.007	0.833
SO_2 (lag 2)	4	0.0003	1.001	0.993	1.010	0.736
SO_2 (lag 3)	4	0.0005	1.002	0.994	1.010	0.588
SO_2 (lag 4)	4	0.0014	1.006	0.998	1.013	0.181
SO_2 (lag 5)	4	-0.0011	0.996	0.988	1.004	0.279
NO_2	15.63	-0.0005	0.992	0.978	1.005	0.235
NO_2 (lag 1)	15.63	0.0001	1.002	0.991	1.014	0.730
NO_2 (lag 2)	15.63	0	1.000	0.988	1.011	0.940
NO_2 (lag 3)	15.63	0.0005	1.008	0.995	1.019	0.207
NO_2 (lag 4)	15.63	0.0002	1.003	0.991	1.014	0.654
NO_2 (lag 5)	15.63	-0.0002	0.997	0.986	1.006	0.509
PM_{10}	16.5	-0.0007	0.989	0.976	1.000	0.038
PM_{10} (lag 1)	16.5	-0.0006	0.990	0.980	1.000	0.049
PM_{10} (lag 2)	16.5	-0.0002	0.997	0.987	1.007	0.485
PM_{10} (lag 3)	16.5	-0.0004	0.993	0.984	1.003	0.157
PM_{10} (lag 4)	16.5	-0.0002	0.997	0.987	1.005	0.419
PM_{10} (lag 5)	16.5	-0.0007	0.989	0.979	0.997	0.010

Chicago and Trespass Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	3	0.0698	1.233	0.954	1.594	0.110
CO (lag 1)	3	0.0953	1.331	1.038	1.707	0.024
CO (lag 2)	3	0.0499	1.161	0.907	1.488	0.236
CO (lag 3)	3	0.0409	1.131	0.882	1.449	0.332
CO (lag 4)	3	0.1295	1.475	1.155	1.884	0.002
CO (lag 5)	3	0.0719	1.241	0.990	1.555	0.061
O_3	0.021	-0.5004	0.989	0.952	1.028	0.582
O_3 (lag 1)	0.021	0.6478	1.014	0.975	1.055	0.489
O_3 (lag 2)	0.021	0.1393	1.003	0.965	1.042	0.879
O_3 (lag 3)	0.021	0.9312	1.020	0.982	1.060	0.312
O_3 (lag 4)	0.021	-0.2327	0.995	0.958	1.034	0.799
O_3 (lag 5)	0.021	0.1049	1.002	0.969	1.036	0.895
$PM_{2.5}$	7.18	-0.0003	0.998	0.972	1.025	0.873
$PM_{2.5}$ (lag 1)	7.18	0.0027	1.020	0.996	1.045	0.106
$PM_{2.5}$ (lag 2)	7.18	0.0039	1.028	1.004	1.053	0.020
$PM_{2.5}$ (lag 3)	7.18	-0.0017	0.988	0.965	1.012	0.311
$PM_{2.5}$ (lag 4)	7.18	-0.0009	0.994	0.971	1.017	0.599
$PM_{2.5}$ (lag 5)	7.18	0.0001	1.001	0.982	1.020	0.928
SO_2	4	-0.0003	0.999	0.982	1.017	0.902
SO_2 (lag 1)	4	-0.0029	0.988	0.972	1.005	0.178
SO_2 (lag 2)	4	0.0016	1.006	0.990	1.023	0.450
SO_2 (lag 3)	4	-0.0016	0.994	0.977	1.010	0.440
SO_2 (lag 4)	4	0.0015	1.006	0.990	1.022	0.478
SO_2 (lag 5)	4	0.0003	1.001	0.985	1.017	0.894
NO_2	15.63	0.0005	1.008	0.981	1.037	0.556
NO_2 (lag 1)	15.63	0.0021	1.033	1.009	1.060	0.007
NO_2 (lag 2)	15.63	0.0007	1.011	0.988	1.035	0.331
NO_2 (lag 3)	15.63	0.0014	1.022	0.998	1.045	0.076
NO_2 (lag 4)	15.63	0.0004	1.006	0.983	1.030	0.614
NO_2 (lag 5)	15.63	0.002	1.032	1.011	1.053	0.003
PM_{10}	16.5	-0.003	0.952	0.928	0.976	<.0001
PM_{10} (lag 1)	16.5	-0.0006	0.990	0.971	1.010	0.332
PM_{10} (lag 2)	16.5	0.0004	1.007	0.987	1.025	0.559
PM_{10} (lag 3)	16.5	-0.0008	0.987	0.968	1.007	0.202
PM_{10} (lag 4)	16.5	-0.0007	0.989	0.968	1.008	0.246
PM_{10} (lag 5)	16.5	-0.0003	0.995	0.976	1.013	0.557

Houston and Assault Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.095	-0.0149	0.999	0.971	1.027	0.921
CO (lag 1)	0.095	-0.1181	0.989	0.966	1.013	0.356
CO (lag 2)	0.095	0.1161	1.011	0.984	1.039	0.423
CO (lag 3)	0.095	-0.056	0.995	0.966	1.024	0.719
CO (lag 4)	0.095	-0.0686	0.994	0.968	1.019	0.617
CO (lag 5)	0.095	0.0702	1.007	0.985	1.029	0.552
O_3	0.0179	1.6047	1.029	0.956	1.108	0.448
O_3 (lag 1)	0.0179	-1.2362	0.978	0.913	1.048	0.532
O_3 (lag 2)	0.0179	-1.7294	0.970	0.898	1.047	0.430
O_3 (lag 3)	0.0179	0.9445	1.017	0.943	1.097	0.660
O_3 (lag 4)	0.0179	0.8535	1.015	0.946	1.089	0.670
O_3 (lag 5)	0.0179	-0.7873	0.986	0.928	1.047	0.646
$PM_{2.5}$	5.23	0.0099	1.053	0.989	1.121	0.105
$PM_{2.5}$ (lag 1)	5.23	-0.0058	0.970	0.916	1.028	0.304
$PM_{2.5}$ (lag 2)	5.23	0.0013	1.007	0.949	1.068	0.825
$PM_{2.5}$ (lag 3)	5.23	-0.0006	0.997	0.939	1.058	0.914
$PM_{2.5}$ (lag 4)	5.23	-0.0069	0.965	0.910	1.022	0.223
$PM_{2.5}$ (lag 5)	5.23	0.0044	1.023	0.973	1.076	0.369
SO_2	3.77	0.0055	1.021	0.973	1.071	0.396
SO_2 (lag 1)	3.77	-0.0072	0.973	0.932	1.016	0.222
SO_2 (lag 2)	3.77	-0.0029	0.989	0.947	1.033	0.614
SO_2 (lag 3)	3.77	0.0004	1.002	0.958	1.047	0.949
SO_2 (lag 4)	3.77	-0.003	0.989	0.942	1.038	0.643
SO_2 (lag 5)	3.77	0.0021	1.008	0.967	1.051	0.711
NO_2	18.4	0.0008	1.015	0.904	1.137	0.805
NO_2 (lag 1)	18.4	-0.0021	0.962	0.869	1.065	0.456
NO_2 (lag 2)	18.4	0.0014	1.026	0.929	1.135	0.610
NO_2 (lag 3)	18.4	0.0001	1.002	0.910	1.104	0.960
NO_2 (lag 4)	18.4	-0.0035	0.938	0.851	1.034	0.195
NO_2 (lag 5)	18.4	0.0025	1.047	0.967	1.135	0.252
PM_{10}	17	-0.0023	0.919	0.909	1.019	0.186
PM_{10} (lag 1)	17	-0.005	0.973	0.813	1.038	0.177
PM_{10} (lag 2)	17	-0.0016	1.015	0.934	1.014	0.183
PM_{10} (lag 3)	17	0.0009	1.012	0.933	1.106	0.717
PM_{10} (lag 4)	17	0.0007	1.040	0.972	1.054	0.582
PM_{10} (lag 5)	17	0.0023	1.000	0.934	1.155	0.472

Houston and Burglary Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.095	-0.1268	0.988	0.963	1.013	0.351
CO (lag 1)	0.095	-0.1907	0.982	0.961	1.004	0.106
CO (lag 2)	0.095	0.2	1.019	0.995	1.044	0.119
CO (lag 3)	0.095	-0.1397	0.987	0.962	1.012	0.305
CO (lag 4)	0.095	0.1383	1.013	0.991	1.035	0.235
CO (lag 5)	0.095	0.0784	1.007	0.988	1.027	0.453
O_3	0.0179	-1.1398	0.980	0.914	1.050	0.565
O_3 (lag 1)	0.0179	0.2341	1.004	0.940	1.073	0.902
O_3 (lag 2)	0.0179	-1.413	0.975	0.905	1.050	0.506
O_3 (lag 3)	0.0179	-0.1305	0.998	0.928	1.072	0.949
O_3 (lag 4)	0.0179	0.5783	1.010	0.944	1.081	0.765
O_3 (lag 5)	0.0179	0.3154	1.006	0.950	1.065	0.846
$PM_{2.5}$	5.23	0.0072	1.038	0.979	1.101	0.207
$PM_{2.5}$ (lag 1)	5.23	-0.0064	0.967	0.915	1.021	0.227
$PM_{2.5}$ (lag 2)	5.23	0.0013	1.007	0.953	1.064	0.805
$PM_{2.5}$ (lag 3)	5.23	-0.0003	0.998	0.944	1.055	0.949
$PM_{2.5}$ (lag 4)	5.23	0.0009	1.005	0.951	1.061	0.873
$PM_{2.5}$ (lag 5)	5.23	0.0009	1.005	0.959	1.053	0.835
SO_2	3.77	0.0027	1.010	0.967	1.055	0.652
SO_2 (lag 1)	3.77	-0.0045	0.983	0.943	1.024	0.418
SO_2 (lag 2)	3.77	-0.0028	0.989	0.950	1.031	0.615
SO_2 (lag 3)	3.77	-0.0004	0.998	0.960	1.039	0.940
SO_2 (lag 4)	3.77	0.0004	1.002	0.959	1.047	0.944
SO_2 (lag 5)	3.77	0.0023	1.009	0.972	1.047	0.648
NO_2	18.4	0.0043	1.082	0.976	1.200	0.132
NO_2 (lag 1)	18.4	-0.0066	0.886	0.806	0.973	0.011
NO_2 (lag 2)	18.4	0.0045	1.086	0.991	1.191	0.079
NO_2 (lag 3)	18.4	-0.0002	0.996	0.912	1.088	0.934
NO_2 (lag 4)	18.4	-0.0042	0.926	0.847	1.013	0.091
NO_2 (lag 5)	18.4	0.0056	1.109	1.030	1.191	0.006
PM_{10}	17	-0.0018	0.970	0.922	1.019	0.218
PM_{10} (lag 1)	17	-0.0042	0.931	0.825	1.051	0.250
PM_{10} (lag 2)	17	-0.0012	0.980	0.942	1.021	0.324
PM_{10} (lag 3)	17	0.0014	1.024	0.942	1.113	0.578
PM_{10} (lag 4)	17	-0.0011	0.981	0.945	1.019	0.324
PM_{10} (lag 5)	17	-0.0019	0.968	0.877	1.067	0.509

Houston and Homicide Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.095	-0.4737	0.956	0.861	1.062	0.401
CO (lag 1)	0.095	0.9297	1.092	1.001	1.192	0.047
CO (lag 2)	0.095	-1.1325	0.898	0.798	1.010	0.073
CO (lag 3)	0.095	0.692	1.068	0.959	1.189	0.230
CO (lag 4)	0.095	-0.3481	0.967	0.874	1.071	0.525
CO (lag 5)	0.095	0.092	1.009	0.926	1.099	0.841
O_3	0.0179	12.2015	1.244	0.939	1.648	0.128
O_3 (lag 1)	0.0179	-5.2066	0.911	0.700	1.185	0.487
O_3 (lag 2)	0.0179	-3.637	0.937	0.700	1.254	0.661
O_3 (lag 3)	0.0179	8.1391	1.157	0.872	1.535	0.312
O_3 (lag 4)	0.0179	-14.8535	0.767	0.585	1.004	0.054
O_3 (lag 5)	0.0179	9.3832	1.183	0.946	1.479	0.140
$PM_{2.5}$	5.23	0.0128	1.069	0.842	1.357	0.583
$PM_{2.5}$ (lag 1)	5.23	0.0148	1.080	0.875	1.335	0.474
$PM_{2.5}$ (lag 2)	5.23	-0.0246	0.879	0.703	1.100	0.260
$PM_{2.5}$ (lag 3)	5.23	0.0229	1.127	0.908	1.400	0.277
$PM_{2.5}$ (lag 4)	5.23	-0.0002	0.999	0.808	1.235	0.991
$PM_{2.5}$ (lag 5)	5.23	-0.0117	0.941	0.777	1.138	0.530
SO_2	3.77	0.013	1.050	0.878	1.256	0.590
SO_2 (lag 1)	3.77	0.0021	1.008	0.864	1.176	0.921
SO_2 (lag 2)	3.77	-0.0017	0.994	0.839	1.177	0.942
SO_2 (lag 3)	3.77	0.0278	1.110	0.949	1.299	0.190
SO_2 (lag 4)	3.77	-0.072	0.762	0.621	0.935	0.009
SO_2 (lag 5)	3.77	0.0191	1.075	0.935	1.235	0.312
NO_2	18.4	0.0112	1.229	0.799	1.894	0.347
NO_2 (lag 1)	18.4	0.0007	1.013	0.692	1.483	0.948
NO_2 (lag 2)	18.4	-0.0179	0.719	0.486	1.065	0.100
NO_2 (lag 3)	18.4	0.0161	1.345	0.921	1.968	0.125
NO_2 (lag 4)	18.4	-0.022	0.667	0.462	0.964	0.031
NO_2 (lag 5)	18.4	0.011	1.224	0.902	1.659	0.194
PM_{10}	17	-0.0048	0.922	0.738	1.153	0.477
PM_{10} (lag 1)	17	-0.0249	0.655	0.368	1.165	0.151
PM_{10} (lag 2)	17	-0.0001	0.998	0.858	1.159	0.976
PM_{10} (lag 3)	17	-0.0049	0.920	0.628	1.349	0.671
PM_{10} (lag 4)	17	-0.0039	0.936	0.792	1.106	0.435
PM_{10} (lag 5)	17	0.0006	1.010	0.671	1.522	0.961

Houston and Motor Vehicle Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.095	0.0726	1.007	0.981	1.034	0.605
CO (lag 1)	0.095	-0.2149	0.980	0.958	1.002	0.075
CO (lag 2)	0.095	0.2066	1.020	0.995	1.045	0.119
CO (lag 3)	0.095	-0.1536	0.986	0.959	1.012	0.286
CO (lag 4)	0.095	-0.0861	0.992	0.969	1.015	0.491
CO (lag 5)	0.095	0.1361	1.013	0.993	1.033	0.205
O_3	0.0179	0.0002	1.000	0.931	1.074	0.9999
O_3 (lag 1)	0.0179	-0.5134	0.991	0.926	1.060	0.789
O_3 (lag 2)	0.0179	-0.8655	0.985	0.914	1.061	0.685
O_3 (lag 3)	0.0179	-0.345	0.994	0.924	1.069	0.868
O_3 (lag 4)	0.0179	0.0027	1.000	0.934	1.071	0.999
O_3 (lag 5)	0.0179	1.6237	1.029	0.972	1.091	0.323
$PM_{2.5}$	5.23	0.0072	1.038	0.978	1.102	0.219
$PM_{2.5}$ (lag 1)	5.23	-0.0069	0.965	0.913	1.020	0.203
$PM_{2.5}$ (lag 2)	5.23	0.0015	1.008	0.953	1.066	0.782
$PM_{2.5}$ (lag 3)	5.23	-0.0058	0.970	0.916	1.027	0.299
$PM_{2.5}$ (lag 4)	5.23	0.0013	1.007	0.953	1.064	0.815
$PM_{2.5}$ (lag 5)	5.23	0.0028	1.015	0.968	1.064	0.540
SO_2	3.77	-0.0125	0.954	0.911	0.999	0.046
SO_2 (lag 1)	3.77	-0.0006	0.998	0.958	1.040	0.921
SO_2 (lag 2)	3.77	-0.0035	0.987	0.947	1.028	0.531
SO_2 (lag 3)	3.77	-0.0009	0.997	0.956	1.038	0.874
SO_2 (lag 4)	3.77	-0.0061	0.977	0.933	1.023	0.326
SO_2 (lag 5)	3.77	-0.0037	0.986	0.948	1.026	0.491
NO_2	18.4	0.001	1.019	0.914	1.133	0.748
NO_2 (lag 1)	18.4	-0.0053	0.907	0.824	0.998	0.046
NO_2 (lag 2)	18.4	0.0048	1.092	0.994	1.202	0.064
NO_2 (lag 3)	18.4	-0.0016	0.971	0.887	1.063	0.519
NO_2 (lag 4)	18.4	-0.0034	0.939	0.857	1.028	0.173
NO_2 (lag 5)	18.4	0.0035	1.067	0.989	1.150	0.096
PM_{10}	17	-0.0008	0.986	0.936	1.038	0.748
PM_{10} (lag 1)	17	-0.003	0.950	0.841	1.072	0.046
PM_{10} (lag 2)	17	-0.0012	0.980	0.942	1.019	0.064
PM_{10} (lag 3)	17	-0.0019	0.968	0.888	1.054	0.519
PM_{10} (lag 4)	17	-0.001	0.983	0.947	1.022	0.173
PM_{10} (lag 5)	17	-0.0049	0.920	0.831	1.021	0.096

Houston and Rape & Sex Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.095	-0.6915	0.936	0.875	1.002	0.056
CO (lag 1)	0.095	-0.1253	0.988	0.937	1.042	0.660
CO (lag 2)	0.095	0.4484	1.044	0.981	1.110	0.176
CO (lag 3)	0.095	-0.4197	0.961	0.898	1.028	0.246
CO (lag 4)	0.095	-0.0998	0.991	0.936	1.048	0.742
CO (lag 5)	0.095	0.1647	1.016	0.969	1.065	0.520
O_3	0.0179	-1.2527	0.978	0.828	1.155	0.792
O_3 (lag 1)	0.0179	-5.77	0.902	0.772	1.054	0.195
O_3 (lag 2)	0.0179	4.3651	1.081	0.909	1.286	0.377
O_3 (lag 3)	0.0179	-4.2274	0.927	0.783	1.097	0.378
O_3 (lag 4)	0.0179	1.0396	1.019	0.870	1.192	0.817
O_3 (lag 5)	0.0179	3.9586	1.073	0.938	1.228	0.303
$PM_{2.5}$	5.23	0.0218	1.121	0.972	1.293	0.117
$PM_{2.5}$ (lag 1)	5.23	-0.0043	0.978	0.861	1.110	0.726
$PM_{2.5}$ (lag 2)	5.23	0.0178	1.098	0.964	1.250	0.162
$PM_{2.5}$ (lag 3)	5.23	-0.0186	0.907	0.791	1.041	0.165
$PM_{2.5}$ (lag 4)	5.23	0.0044	1.023	0.899	1.164	0.728
$PM_{2.5}$ (lag 5)	5.23	0.0066	1.035	0.925	1.158	0.551
SO_2	3.77	0.0137	1.053	0.946	1.172	0.344
SO_2 (lag 1)	3.77	-0.013	0.952	0.861	1.053	0.340
SO_2 (lag 2)	3.77	0.0126	1.049	0.958	1.148	0.306
SO_2 (lag 3)	3.77	0.0036	1.014	0.919	1.119	0.785
SO_2 (lag 4)	3.77	-0.0351	0.876	0.781	0.982	0.024
SO_2 (lag 5)	3.77	0.0165	1.064	0.976	1.161	0.160
NO_2	18.4	0.003	1.057	0.814	1.370	0.682
NO_2 (lag 1)	18.4	-0.0019	0.966	0.769	1.215	0.767
NO_2 (lag 2)	18.4	0.0053	1.102	0.878	1.385	0.405
NO_2 (lag 3)	18.4	-0.0049	0.914	0.735	1.135	0.417
NO_2 (lag 4)	18.4	-0.0031	0.945	0.759	1.178	0.616
NO_2 (lag 5)	18.4	0.0049	1.094	0.912	1.311	0.335
PM_{10}	17	0.003	1.052	0.827	1.337	0.682
PM_{10} (lag 1)	17	-0.0019	0.968	0.784	1.197	0.767
PM_{10} (lag 2)	17	0.0053	1.094	0.886	1.351	0.405
PM_{10} (lag 3)	17	-0.0049	0.920	0.753	1.124	0.417
PM_{10} (lag 4)	17	-0.0031	0.949	0.775	1.163	0.616
PM_{10} (lag 5)	17	0.0049	1.087	0.919	1.284	0.335

Houston and Robbery Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.095	0.0779	1.007	0.979	1.036	0.610
CO (lag 1)	0.095	-0.1629	0.985	0.961	1.009	0.209
CO (lag 2)	0.095	0.2679	1.026	0.999	1.053	0.060
CO (lag 3)	0.095	-0.0921	0.991	0.963	1.021	0.556
CO (lag 4)	0.095	-0.0437	0.996	0.971	1.022	0.750
CO (lag 5)	0.095	0.1577	1.015	0.993	1.037	0.175
O_3	0.0179	-0.6331	0.989	0.914	1.069	0.777
O_3 (lag 1)	0.0179	1.0314	1.019	0.946	1.096	0.622
O_3 (lag 2)	0.0179	0.1363	1.002	0.924	1.088	0.953
O_3 (lag 3)	0.0179	-2.833	0.951	0.878	1.029	0.213
O_3 (lag 4)	0.0179	2.263	1.041	0.966	1.122	0.289
O_3 (lag 5)	0.0179	-1.7554	0.969	0.909	1.033	0.336
$PM_{2.5}$	5.23	0.0083	1.044	0.977	1.116	0.198
$PM_{2.5}$ (lag 1)	5.23	-0.0028	0.985	0.927	1.047	0.635
$PM_{2.5}$ (lag 2)	5.23	0.0028	1.015	0.955	1.079	0.639
$PM_{2.5}$ (lag 3)	5.23	-0.0034	0.982	0.922	1.046	0.577
$PM_{2.5}$ (lag 4)	5.23	0.0013	1.007	0.947	1.070	0.822
$PM_{2.5}$ (lag 5)	5.23	-0.0016	0.992	0.941	1.045	0.761
SO_2	3.77	-0.0091	0.966	0.918	1.016	0.183
SO_2 (lag 1)	3.77	-0.0019	0.993	0.949	1.039	0.754
SO_2 (lag 2)	3.77	0.0002	1.001	0.958	1.045	0.974
SO_2 (lag 3)	3.77	-0.0037	0.986	0.942	1.032	0.549
SO_2 (lag 4)	3.77	0.0064	1.024	0.975	1.076	0.343
SO_2 (lag 5)	3.77	-0.0051	0.981	0.939	1.025	0.395
NO_2	18.4	-0.0026	0.953	0.846	1.072	0.426
NO_2 (lag 1)	18.4	-0.0064	0.889	0.800	0.989	0.029
NO_2 (lag 2)	18.4	0.0071	1.140	1.028	1.263	0.013
NO_2 (lag 3)	18.4	-0.0017	0.969	0.878	1.072	0.549
NO_2 (lag 4)	18.4	-0.0018	0.967	0.874	1.068	0.512
NO_2 (lag 5)	18.4	0.001	1.019	0.938	1.106	0.662
PM_{10}	17	-0.0026	0.957	0.857	1.067	0.426
PM_{10} (lag 1)	17	-0.0064	0.897	0.814	0.990	0.029
PM_{10} (lag 2)	17	0.0071	1.128	1.026	1.241	0.013
PM_{10} (lag 3)	17	-0.0017	0.972	0.886	1.067	0.549
PM_{10} (lag 4)	17	-0.0018	0.970	0.883	1.063	0.512
PM_{10} (lag 5)	17	0.001	1.017	0.942	1.098	0.662

Houston and Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.095	-0.0577	0.995	0.972	1.018	0.641
CO (lag 1)	0.095	-0.1712	0.984	0.965	1.003	0.106
CO (lag 2)	0.095	0.1889	1.018	0.996	1.040	0.106
CO (lag 3)	0.095	-0.0801	0.992	0.969	1.016	0.524
CO (lag 4)	0.095	-0.0569	0.995	0.975	1.015	0.602
CO (lag 5)	0.095	0.1654	1.016	0.998	1.034	0.079
O_3	0.0179	0.0367	1.001	0.940	1.066	0.984
O_3 (lag 1)	0.0179	-0.6952	0.988	0.930	1.048	0.683
O_3 (lag 2)	0.0179	-0.4077	0.993	0.929	1.061	0.830
O_3 (lag 3)	0.0179	0.4754	1.009	0.945	1.076	0.796
O_3 (lag 4)	0.0179	0.0764	1.001	0.942	1.064	0.965
O_3 (lag 5)	0.0179	0.0905	1.002	0.951	1.054	0.951
$PM_{2.5}$	5.23	0.005	1.026	0.974	1.082	0.332
$PM_{2.5}$ (lag 1)	5.23	-0.004	0.979	0.933	1.028	0.398
$PM_{2.5}$ (lag 2)	5.23	0.0012	1.006	0.958	1.058	0.804
$PM_{2.5}$ (lag 3)	5.23	-0.0023	0.988	0.940	1.039	0.643
$PM_{2.5}$ (lag 4)	5.23	-0.0003	0.998	0.951	1.049	0.955
$PM_{2.5}$ (lag 5)	5.23	0.0008	1.004	0.963	1.048	0.852
SO_2	3.77	-0.0068	0.975	0.936	1.015	0.214
SO_2 (lag 1)	3.77	0.0005	1.002	0.966	1.039	0.917
SO_2 (lag 2)	3.77	0.0011	1.004	0.969	1.041	0.815
SO_2 (lag 3)	3.77	-0.001	0.996	0.961	1.033	0.834
SO_2 (lag 4)	3.77	-0.0018	0.993	0.954	1.034	0.739
SO_2 (lag 5)	3.77	-0.0027	0.990	0.956	1.025	0.572
NO_2	18.4	0.0009	1.017	0.926	1.119	0.720
NO_2 (lag 1)	18.4	-0.0039	0.931	0.855	1.013	0.100
NO_2 (lag 2)	18.4	0.0034	1.065	0.978	1.156	0.149
NO_2 (lag 3)	18.4	0.0004	1.007	0.929	1.090	0.861
NO_2 (lag 4)	18.4	-0.0028	0.950	0.876	1.028	0.205
NO_2 (lag 5)	18.4	0.0027	1.051	0.984	1.123	0.143
PM_{10}	17	-0.0009	0.995	0.972	1.018	0.513
PM_{10} (lag 1)	17	0.001	0.984	0.965	1.003	0.743
PM_{10} (lag 2)	17	-0.001	1.018	0.996	1.040	0.329
PM_{10} (lag 3)	17	-0.0016	0.992	0.969	1.016	0.482
PM_{10} (lag 4)	17	-0.0014	0.995	0.975	1.015	0.174
PM_{10} (lag 5)	17	-0.0033	1.016	0.998	1.034	0.220

Philadelphia and Assault Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.1	-0.0206	0.998	0.981	1.015	0.816
CO (lag 1)	0.1	-0.067	0.993	0.980	1.007	0.332
CO (lag 2)	0.1	-0.023	0.998	0.983	1.012	0.756
CO (lag 3)	0.1	0.0011	1.000	0.985	1.015	0.988
CO (lag 4)	0.1	0.0617	1.006	0.991	1.021	0.420
CO (lag 5)	0.1	-0.0647	0.994	0.981	1.006	0.308
O_3	0.02	1.4702	1.030	0.977	1.085	0.274
O_3 (lag 1)	0.02	0.466	1.009	0.960	1.061	0.717
O_3 (lag 2)	0.02	-0.1806	0.996	0.947	1.048	0.888
O_3 (lag 3)	0.02	1.0278	1.021	0.970	1.074	0.426
O_3 (lag 4)	0.02	-2.0425	0.960	0.913	1.010	0.113
O_3 (lag 5)	0.02	3.1377	1.065	1.017	1.115	0.007
$PM_{2.5}$	6.9	0.0011	1.008	0.961	1.056	0.752
$PM_{2.5}$ (lag 1)	6.9	-0.0043	0.971	0.935	1.008	0.120
$PM_{2.5}$ (lag 2)	6.9	0.0052	1.037	0.998	1.077	0.062
$PM_{2.5}$ (lag 3)	6.9	-0.0019	0.987	0.949	1.026	0.509
$PM_{2.5}$ (lag 4)	6.9	0.0036	1.025	0.986	1.066	0.214
$PM_{2.5}$ (lag 5)	6.9	-0.005	0.966	0.936	0.997	0.034
SO_2	3.4	0.0023	1.008	0.977	1.040	0.626
SO_2 (lag 1)	3.4	0.0029	1.010	0.975	1.046	0.580
SO_2 (lag 2)	3.4	-0.0048	0.984	0.949	1.020	0.373
SO_2 (lag 3)	3.4	0.006	1.020	0.993	1.049	0.153
SO_2 (lag 4)	3.4	0.0015	1.005	0.972	1.039	0.762
SO_2 (lag 5)	3.4	0.0031	1.010	0.978	1.045	0.535
NO_2	15.1	-0.0004	0.994	0.949	1.043	0.818
NO_2 (lag 1)	15.1	0.0015	1.023	0.982	1.065	0.273
NO_2 (lag 2)	15.1	-0.0021	0.969	0.929	1.009	0.127
NO_2 (lag 3)	15.1	-0.0002	0.997	0.956	1.038	0.862
NO_2 (lag 4)	15.1	0.0014	1.021	0.981	1.064	0.322
NO_2 (lag 5)	15.1	-0.0013	0.981	0.946	1.017	0.293
PM_{10}	14	0.0053	1.077	0.999	1.162	0.055
PM_{10} (lag 1)	14	0.0001	1.001	0.942	1.067	0.959
PM_{10} (lag 2)	14	0.0029	1.041	0.982	1.105	0.178
PM_{10} (lag 3)	14	-0.0024	0.967	0.914	1.021	0.231
PM_{10} (lag 4)	14	0.0005	1.007	0.951	1.067	0.805
PM_{10} (lag 5)	14	-0.0012	0.983	0.931	1.037	0.531

Philadelphia and Burglary Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.1	-0.0066	0.999	0.982	1.017	0.942
CO (lag 1)	0.1	-0.0339	0.997	0.983	1.010	0.630
CO (lag 2)	0.1	0.0409	1.004	0.989	1.019	0.589
CO (lag 3)	0.1	0.0366	1.004	0.988	1.019	0.642
CO (lag 4)	0.1	-0.2273	0.978	0.961	0.994	0.008
CO (lag 5)	0.1	0.0526	1.005	0.993	1.018	0.403
O_3	0.02	0.2916	1.006	0.951	1.064	0.838
O_3 (lag 1)	0.02	-2.6711	0.948	0.898	1.000	0.052
O_3 (lag 2)	0.02	0.6514	1.013	0.960	1.070	0.638
O_3 (lag 3)	0.02	0.5461	1.011	0.958	1.067	0.693
O_3 (lag 4)	0.02	-0.8875	0.982	0.931	1.037	0.520
O_3 (lag 5)	0.02	1.3981	1.028	0.979	1.080	0.262
$PM_{2.5}$	6.9	0.0024	1.017	0.968	1.069	0.507
$PM_{2.5}$ (lag 1)	6.9	0.0021	1.015	0.975	1.056	0.475
$PM_{2.5}$ (lag 2)	6.9	0.0024	1.017	0.977	1.058	0.419
$PM_{2.5}$ (lag 3)	6.9	0.0031	1.022	0.981	1.064	0.302
$PM_{2.5}$ (lag 4)	6.9	-0.007	0.953	0.914	0.992	0.020
$PM_{2.5}$ (lag 5)	6.9	0.0052	1.037	1.003	1.070	0.028
SO_2	3.4	0.0034	1.012	0.979	1.046	0.495
SO_2 (lag 1)	3.4	0.0087	1.030	0.993	1.068	0.118
SO_2 (lag 2)	3.4	-0.0042	0.986	0.950	1.024	0.459
SO_2 (lag 3)	3.4	0.0046	1.016	0.985	1.046	0.319
SO_2 (lag 4)	3.4	-0.0083	0.972	0.939	1.007	0.123
SO_2 (lag 5)	3.4	0.0017	1.006	0.971	1.042	0.751
NO_2	15.1	0.0008	1.012	0.963	1.065	0.628
NO_2 (lag 1)	15.1	0.0001	1.002	0.959	1.046	0.953
NO_2 (lag 2)	15.1	-0.0001	0.998	0.956	1.045	0.963
NO_2 (lag 3)	15.1	0.0006	1.009	0.966	1.054	0.678
NO_2 (lag 4)	15.1	-0.001	0.985	0.943	1.028	0.476
NO_2 (lag 5)	15.1	0.0016	1.024	0.987	1.065	0.207
PM_{10}	14	-0.0009	1.077	0.999	1.162	0.768
PM_{10} (lag 1)	14	0.001	1.014	0.950	1.085	0.679
PM_{10} (lag 2)	14	0.0008	1.011	0.947	1.079	0.741
PM_{10} (lag 3)	14	0.0003	1.004	0.944	1.068	0.882
PM_{10} (lag 4)	14	-0.0014	0.981	0.921	1.044	0.537
PM_{10} (lag 5)	14	0	1.000	0.943	1.059	0.984

Philadelphia and Homicide Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.1	-0.1737	0.983	0.914	1.056	0.637
CO (lag 1)	0.1	0.1194	1.012	0.959	1.068	0.665
CO (lag 2)	0.1	0.0241	1.002	0.949	1.059	0.932
CO (lag 3)	0.1	0.6199	1.064	1.008	1.123	0.024
CO (lag 4)	0.1	0.131	1.013	0.950	1.081	0.690
CO (lag 5)	0.1	-0.3139	0.969	0.914	1.027	0.292
O_3	0.02	0.0762	1.002	0.796	1.260	0.990
O_3 (lag 1)	0.02	-2.6073	0.949	0.762	1.182	0.641
O_3 (lag 2)	0.02	-0.0644	0.999	0.803	1.243	0.991
O_3 (lag 3)	0.02	0.0356	1.001	0.804	1.245	0.995
O_3 (lag 4)	0.02	-0.71	0.986	0.793	1.226	0.898
O_3 (lag 5)	0.02	2.1561	1.044	0.857	1.273	0.669
$PM_{2.5}$	6.9	-0.0172	0.888	0.724	1.089	0.253
$PM_{2.5}$ (lag 1)	6.9	0.0087	1.062	0.911	1.240	0.443
$PM_{2.5}$ (lag 2)	6.9	-0.0176	0.885	0.757	1.036	0.129
$PM_{2.5}$ (lag 3)	6.9	0.0392	1.312	1.126	1.531	0.001
$PM_{2.5}$ (lag 4)	6.9	0.0057	1.040	0.883	1.226	0.636
$PM_{2.5}$ (lag 5)	6.9	-0.0124	0.918	0.799	1.053	0.222
SO_2	3.4	0.0022	1.007	0.889	1.142	0.907
SO_2 (lag 1)	3.4	0.0133	1.046	0.902	1.212	0.552
SO_2 (lag 2)	3.4	-0.0015	0.995	0.858	1.154	0.947
SO_2 (lag 3)	3.4	0.024	1.084	0.974	1.207	0.140
SO_2 (lag 4)	3.4	0.0283	1.100	0.958	1.262	0.176
SO_2 (lag 5)	3.4	-0.048	0.851	0.733	0.988	0.034
NO_2	15.1	0.0083	1.134	0.926	1.386	0.224
NO_2 (lag 1)	15.1	0.0088	1.142	0.964	1.353	0.125
NO_2 (lag 2)	15.1	-0.0018	0.973	0.817	1.159	0.763
NO_2 (lag 3)	15.1	0.0105	1.172	0.985	1.394	0.073
NO_2 (lag 4)	15.1	0.0083	1.134	0.959	1.340	0.142
NO_2 (lag 5)	15.1	-0.0079	0.888	0.757	1.038	0.137
PM_{10}	14	0.0268	1.077	0.999	1.162	0.036
PM_{10} (lag 1)	14	0.0192	1.308	1.003	1.709	0.048
PM_{10} (lag 2)	14	-0.0011	0.985	0.763	1.270	0.903
PM_{10} (lag 3)	14	0.0182	1.290	1.017	1.637	0.036
PM_{10} (lag 4)	14	0.0195	1.314	1.017	1.695	0.037
PM_{10} (lag 5)	14	-0.0166	0.793	0.620	1.011	0.061

Philadelphia and Motor Vehicle Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.1	-0.2623	0.974	0.937	1.012	0.180
CO (lag 1)	0.1	-0.2795	0.972	0.944	1.001	0.062
CO (lag 2)	0.1	0.0745	1.007	0.978	1.037	0.618
CO (lag 3)	0.1	0.2849	1.029	0.998	1.061	0.066
CO (lag 4)	0.1	-0.2447	0.976	0.944	1.008	0.144
CO (lag 5)	0.1	0.3372	1.034	1.010	1.059	0.006
O_3	0.02	6.2889	1.134	1.009	1.274	0.034
O_3 (lag 1)	0.02	0.2687	1.005	0.898	1.125	0.926
O_3 (lag 2)	0.02	1.8464	1.038	0.927	1.161	0.521
O_3 (lag 3)	0.02	0.6643	1.013	0.906	1.133	0.816
O_3 (lag 4)	0.02	0.2789	1.006	0.898	1.126	0.923
O_3 (lag 5)	0.02	4.5054	1.094	0.988	1.212	0.085
$PM_{2.5}$	6.9	0.011	1.079	0.971	1.200	0.158
$PM_{2.5}$ (lag 1)	6.9	-0.0036	0.975	0.897	1.061	0.563
$PM_{2.5}$ (lag 2)	6.9	0.0062	1.044	0.961	1.134	0.305
$PM_{2.5}$ (lag 3)	6.9	0.0039	1.027	0.944	1.118	0.533
$PM_{2.5}$ (lag 4)	6.9	-0.0049	0.967	0.888	1.051	0.426
$PM_{2.5}$ (lag 5)	6.9	0.0103	1.074	1.005	1.149	0.036
SO_2	3.4	0.016	1.055	0.990	1.125	0.101
SO_2 (lag 1)	3.4	-0.0044	0.985	0.915	1.062	0.698
SO_2 (lag 2)	3.4	-0.0044	0.985	0.912	1.064	0.706
SO_2 (lag 3)	3.4	0.01	1.034	0.976	1.095	0.252
SO_2 (lag 4)	3.4	0.0111	1.038	0.970	1.110	0.277
SO_2 (lag 5)	3.4	0.0004	1.001	0.934	1.074	0.967
NO_2	15.1	0.0108	1.177	1.065	1.302	0.002
NO_2 (lag 1)	15.1	-0.0045	0.934	0.856	1.021	0.133
NO_2 (lag 2)	15.1	0.0045	1.070	0.979	1.170	0.136
NO_2 (lag 3)	15.1	0.0062	1.098	1.006	1.199	0.036
NO_2 (lag 4)	15.1	0.0013	1.020	0.939	1.110	0.639
NO_2 (lag 5)	15.1	0.0063	1.100	1.017	1.188	0.016
PM_{10}	14	-0.0011	1.077	0.999	1.162	0.804
PM_{10} (lag 1)	14	0.0033	1.047	0.950	1.157	0.355
PM_{10} (lag 2)	14	-0.0035	0.952	0.865	1.047	0.314
PM_{10} (lag 3)	14	-0.0005	0.993	0.908	1.086	0.875
PM_{10} (lag 4)	14	-0.0037	0.950	0.866	1.041	0.273
PM_{10} (lag 5)	14	0.0039	1.056	0.971	1.150	0.199

Philadelphia and Rape & Sex Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.1	-0.2241	0.978	0.936	1.021	0.313
CO (lag 1)	0.1	0.1604	1.016	0.982	1.052	0.360
CO (lag 2)	0.1	-0.273	0.973	0.937	1.010	0.151
CO (lag 3)	0.1	0.0158	1.002	0.966	1.038	0.931
CO (lag 4)	0.1	0.3096	1.031	0.993	1.072	0.111
CO (lag 5)	0.1	-0.0955	0.990	0.960	1.022	0.548
O_3	0.02	-0.3578	0.993	0.870	1.133	0.915
O_3 (lag 1)	0.02	-0.4864	0.990	0.874	1.122	0.878
O_3 (lag 2)	0.02	1.2517	1.025	0.905	1.162	0.695
O_3 (lag 3)	0.02	-1.554	0.969	0.854	1.100	0.629
O_3 (lag 4)	0.02	3.5935	1.075	0.947	1.219	0.265
O_3 (lag 5)	0.02	-6.6305	0.876	0.782	0.981	0.021
$PM_{2.5}$	6.9	-0.0128	0.915	0.814	1.029	0.138
$PM_{2.5}$ (lag 1)	6.9	0.0166	1.122	1.022	1.232	0.015
$PM_{2.5}$ (lag 2)	6.9	-0.0136	0.910	0.825	1.003	0.058
$PM_{2.5}$ (lag 3)	6.9	0.0051	1.036	0.940	1.142	0.476
$PM_{2.5}$ (lag 4)	6.9	-0.0011	0.992	0.900	1.094	0.875
$PM_{2.5}$ (lag 5)	6.9	-0.002	0.986	0.913	1.066	0.729
SO_2	3.4	-0.04	0.874	0.797	0.958	0.004
SO_2 (lag 1)	3.4	0.047	1.171	1.073	1.279	0.000
SO_2 (lag 2)	3.4	-0.0178	0.942	0.852	1.041	0.241
SO_2 (lag 3)	3.4	-0.0058	0.981	0.903	1.065	0.643
SO_2 (lag 4)	3.4	-0.0009	0.997	0.911	1.091	0.948
SO_2 (lag 5)	3.4	-0.0179	0.942	0.861	1.029	0.182
NO_2	15.1	0.002	1.031	0.913	1.161	0.629
NO_2 (lag 1)	15.1	0.0073	1.117	1.006	1.237	0.038
NO_2 (lag 2)	15.1	-0.007	0.900	0.811	1.000	0.051
NO_2 (lag 3)	15.1	0.0021	1.032	0.931	1.144	0.548
NO_2 (lag 4)	15.1	-0.0028	0.959	0.865	1.064	0.427
NO_2 (lag 5)	15.1	0.0017	1.026	0.937	1.123	0.577
PM_{10}	14	0.014	1.077	0.999	1.162	0.032
PM_{10} (lag 1)	14	0.0037	1.053	0.914	1.213	0.476
PM_{10} (lag 2)	14	-0.0092	0.879	0.768	1.006	0.061
PM_{10} (lag 3)	14	0.0039	1.056	0.928	1.203	0.408
PM_{10} (lag 4)	14	0.006	1.088	0.950	1.244	0.226
PM_{10} (lag 5)	14	-0.0012	0.983	0.869	1.112	0.793

Philadelphia and Robbery Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.1	0.0013	1.000	0.984	1.017	0.987
CO (lag 1)	0.1	-0.0481	0.995	0.983	1.008	0.459
CO (lag 2)	0.1	0.0515	1.005	0.991	1.019	0.464
CO (lag 3)	0.1	-0.0311	0.997	0.983	1.011	0.672
CO (lag 4)	0.1	-0.2262	0.978	0.963	0.993	0.003
CO (lag 5)	0.1	0.0268	1.003	0.991	1.014	0.647
O_3	0.02	-2.1177	0.959	0.910	1.009	0.108
O_3 (lag 1)	0.02	0.1596	1.003	0.955	1.054	0.900
O_3 (lag 2)	0.02	0.276	1.006	0.957	1.057	0.829
O_3 (lag 3)	0.02	-0.6366	0.987	0.939	1.038	0.619
O_3 (lag 4)	0.02	-0.8509	0.983	0.935	1.033	0.504
O_3 (lag 5)	0.02	-0.1633	0.997	0.953	1.043	0.888
$PM_{2.5}$	6.9	0.0018	1.013	0.967	1.060	0.602
$PM_{2.5}$ (lag 1)	6.9	0.0011	1.008	0.971	1.045	0.683
$PM_{2.5}$ (lag 2)	6.9	-0.0022	0.985	0.949	1.022	0.421
$PM_{2.5}$ (lag 3)	6.9	0.0001	1.001	0.963	1.039	0.984
$PM_{2.5}$ (lag 4)	6.9	-0.0057	0.961	0.925	0.998	0.038
$PM_{2.5}$ (lag 5)	6.9	0.002	1.014	0.984	1.045	0.356
SO_2	3.4	0.0033	1.011	0.982	1.042	0.454
SO_2 (lag 1)	3.4	0.0094	1.032	0.998	1.067	0.064
SO_2 (lag 2)	3.4	0.001	1.003	0.970	1.038	0.837
SO_2 (lag 3)	3.4	0.0073	1.025	0.998	1.052	0.068
SO_2 (lag 4)	3.4	-0.0086	0.971	0.941	1.003	0.077
SO_2 (lag 5)	3.4	0.0036	1.012	0.981	1.044	0.449
NO_2	15.1	-0.0024	0.964	0.922	1.011	0.133
NO_2 (lag 1)	15.1	0.0019	1.029	0.988	1.070	0.162
NO_2 (lag 2)	15.1	-0.0004	0.994	0.954	1.035	0.783
NO_2 (lag 3)	15.1	0.0015	1.023	0.982	1.064	0.270
NO_2 (lag 4)	15.1	-0.0025	0.963	0.926	1.002	0.062
NO_2 (lag 5)	15.1	-0.0009	0.987	0.951	1.021	0.433
PM_{10}	14	0.0024	1.077	0.999	1.162	0.336
PM_{10} (lag 1)	14	0.0007	1.010	0.955	1.070	0.717
PM_{10} (lag 2)	14	-0.0013	0.982	0.931	1.037	0.516
PM_{10} (lag 3)	14	-0.0008	0.989	0.940	1.040	0.668
PM_{10} (lag 4)	14	-0.0048	0.935	0.887	0.985	0.011
PM_{10} (lag 5)	14	-0.0005	0.993	0.947	1.043	0.787

Philadelphia and Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.1	0.0121	1.001	0.992	1.011	0.8037
CO (lag 1)	0.1	-0.0448	0.996	0.988	1.003	0.239
CO (lag 2)	0.1	0.0705	1.007	0.999	1.015	0.080
CO (lag 3)	0.1	0.0446	1.004	0.996	1.013	0.284
CO (lag 4)	0.1	-0.0529	0.995	0.986	1.003	0.228
CO (lag 5)	0.1	0.0955	1.010	1.003	1.016	0.005
O_3	0.02	-0.0926	0.998	0.969	1.028	0.903
O_3 (lag 1)	0.02	-0.8787	0.983	0.955	1.011	0.225
O_3 (lag 2)	0.02	-0.5853	0.988	0.961	1.017	0.421
O_3 (lag 3)	0.02	0.2122	1.004	0.976	1.033	0.769
O_3 (lag 4)	0.02	-0.4931	0.990	0.962	1.019	0.496
O_3 (lag 5)	0.02	0.8097	1.016	0.990	1.043	0.218
$PM_{2.5}$	6.9	-0.0002	0.999	0.972	1.026	0.924
$PM_{2.5}$ (lag 1)	6.9	0.0011	1.008	0.986	1.030	0.493
$PM_{2.5}$ (lag 2)	6.9	-0.0003	0.998	0.977	1.020	0.850
$PM_{2.5}$ (lag 3)	6.9	0.0009	1.006	0.985	1.029	0.561
$PM_{2.5}$ (lag 4)	6.9	-0.0003	0.998	0.976	1.020	0.845
$PM_{2.5}$ (lag 5)	6.9	0.002	1.014	0.997	1.032	0.123
SO_2	3.4	-0.0005	0.998	0.981	1.016	0.864
SO_2 (lag 1)	3.4	0.0022	1.007	0.988	1.028	0.470
SO_2 (lag 2)	3.4	0.003	1.010	0.990	1.031	0.322
SO_2 (lag 3)	3.4	0.004	1.014	0.997	1.030	0.099
SO_2 (lag 4)	3.4	0.0015	1.005	0.986	1.024	0.606
SO_2 (lag 5)	3.4	-0.0009	0.997	0.978	1.016	0.746
NO_2	15.1	-0.0007	0.989	0.963	1.017	0.432
NO_2 (lag 1)	15.1	0.0008	1.012	0.989	1.037	0.300
NO_2 (lag 2)	15.1	0.0001	1.002	0.978	1.024	0.932
NO_2 (lag 3)	15.1	0.0015	1.023	0.998	1.046	0.065
NO_2 (lag 4)	15.1	-0.0002	0.997	0.975	1.020	0.824
NO_2 (lag 5)	15.1	0.0008	1.012	0.992	1.034	0.236
PM_{10}	14	-0.0024	1.077	0.999	1.162	0.083
PM_{10} (lag 1)	14	-0.0006	0.992	0.963	1.023	0.620
PM_{10} (lag 2)	14	-0.0007	0.990	0.962	1.020	0.504
PM_{10} (lag 3)	14	0.0013	1.018	0.992	1.047	0.186
PM_{10} (lag 4)	14	-0.0005	0.993	0.966	1.023	0.652
PM_{10} (lag 5)	14	0.0007	1.010	0.983	1.037	0.449

Seattle and Arson & Burning Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-7.1861	0.238	0.117	0.483	<.0001
CO (lag 1)	0.2	1.9054	1.464	0.833	2.573	0.186
CO (lag 2)	0.2	0.0112	1.002	0.576	1.745	0.994
CO (lag 3)	0.2	0.2874	1.059	0.598	1.875	0.844
CO (lag 4)	0.2	-0.347	0.933	0.524	1.662	0.814
CO (lag 5)	0.2	-1.5828	0.729	0.427	1.245	0.247
O_3	0.013	-9.2243	0.887	0.522	1.507	0.657
O_3 (lag 1)	0.013	-20.7927	0.763	0.449	1.298	0.318
O_3 (lag 2)	0.013	23.0992	1.350	0.812	2.244	0.247
O_3 (lag 3)	0.013	-17.1689	0.800	0.484	1.321	0.383
O_3 (lag 4)	0.013	-11.4088	0.862	0.517	1.437	0.569
O_3 (lag 5)	0.013	22.6766	1.343	0.831	2.169	0.228
$PM_{2.5}$	4.18	0.0661	1.318	0.877	1.982	0.184
$PM_{2.5}$ (lag 1)	4.18	0.023	1.101	0.726	1.669	0.651
$PM_{2.5}$ (lag 2)	4.18	0.0551	1.259	0.846	1.873	0.256
$PM_{2.5}$ (lag 3)	4.18	-0.031	0.879	0.572	1.349	0.554
$PM_{2.5}$ (lag 4)	4.18	0.0522	1.244	0.832	1.858	0.288
$PM_{2.5}$ (lag 5)	4.18	-0.0287	0.887	0.618	1.273	0.516
SO_2	3.5	-0.0145	0.951	0.788	1.147	0.597
SO_2 (lag 1)	3.5	0.0007	1.002	0.842	1.193	0.980
SO_2 (lag 2)	3.5	0.0084	1.030	0.873	1.214	0.728
SO_2 (lag 3)	3.5	0.0014	1.005	0.845	1.195	0.955
SO_2 (lag 4)	3.5	0.0022	1.008	0.841	1.208	0.935
SO_2 (lag 5)	3.5	-0.0092	0.968	0.817	1.148	0.710

Seattle and Assault Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-2.1873	0.646	0.589	0.708	<.0001
CO (lag 1)	0.2	-0.744	0.862	0.790	0.940	0.001
CO (lag 2)	0.2	-0.4766	0.909	0.837	0.987	0.024
CO (lag 3)	0.2	-0.4492	0.914	0.842	0.992	0.032
CO (lag 4)	0.2	-0.5358	0.898	0.827	0.975	0.011
CO (lag 5)	0.2	-0.7028	0.869	0.809	0.933	0.000
O_3	0.013	-0.6387	0.992	0.903	1.090	0.863
O_3 (lag 1)	0.013	-9.4979	0.884	0.806	0.969	0.009
O_3 (lag 2)	0.013	-4.7671	0.940	0.860	1.027	0.171
O_3 (lag 3)	0.013	2.2409	1.030	0.941	1.126	0.524
O_3 (lag 4)	0.013	-1.2739	0.984	0.899	1.076	0.718
O_3 (lag 5)	0.013	0.6515	1.009	0.929	1.095	0.840
$PM_{2.5}$	4.18	0.0574	1.271	1.175	1.375	<.0001
$PM_{2.5}$ (lag 1)	4.18	0.0193	1.084	1.002	1.172	0.045
$PM_{2.5}$ (lag 2)	4.18	-0.007	0.971	0.899	1.049	0.457
$PM_{2.5}$ (lag 3)	4.18	0.0037	1.016	0.939	1.098	0.698
$PM_{2.5}$ (lag 4)	4.18	-0.0079	0.968	0.895	1.046	0.409
$PM_{2.5}$ (lag 5)	4.18	0.0058	1.025	0.961	1.093	0.458
SO_2	3.5	0.0007	1.002	0.969	1.037	0.889
SO_2 (lag 1)	3.5	-0.0015	0.995	0.962	1.029	0.759
SO_2 (lag 2)	3.5	-0.0138	0.953	0.920	0.987	0.007
SO_2 (lag 3)	3.5	-0.0122	0.958	0.925	0.993	0.020
SO_2 (lag 4)	3.5	-0.0099	0.966	0.932	1.001	0.058
SO_2 (lag 5)	3.5	-0.0145	0.951	0.919	0.983	0.003

Seattle and Burglary Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-1.7376	0.706	0.658	0.758	<.0001
CO (lag 1)	0.2	-0.2219	0.957	0.894	1.024	0.201
CO (lag 2)	0.2	-0.513	0.902	0.844	0.965	0.003
CO (lag 3)	0.2	-0.4798	0.909	0.850	0.971	0.005
CO (lag 4)	0.2	-0.4836	0.908	0.849	0.971	0.005
CO (lag 5)	0.2	-0.7358	0.863	0.815	0.914	<.0001
O_3	0.013	-7.2196	0.910	0.839	0.988	0.025
O_3 (lag 1)	0.013	-7.1565	0.911	0.841	0.987	0.023
O_3 (lag 2)	0.013	-1.0602	0.986	0.912	1.066	0.729
O_3 (lag 3)	0.013	2.0867	1.027	0.950	1.111	0.496
O_3 (lag 4)	0.013	-3.6936	0.953	0.882	1.030	0.226
O_3 (lag 5)	0.013	-1.5348	0.980	0.913	1.052	0.582
$PM_{2.5}$	4.18	0.0499	1.232	1.150	1.319	<.0001
$PM_{2.5}$ (lag 1)	4.18	0.0256	1.113	1.042	1.189	0.002
$PM_{2.5}$ (lag 2)	4.18	-0.0104	0.958	0.895	1.024	0.206
$PM_{2.5}$ (lag 3)	4.18	-0.0042	0.983	0.918	1.051	0.612
$PM_{2.5}$ (lag 4)	4.18	0.0005	1.002	0.939	1.070	0.946
$PM_{2.5}$ (lag 5)	4.18	-0.0038	0.984	0.931	1.040	0.570
SO_2	3.5	-0.0098	0.966	0.936	0.998	0.036
SO_2 (lag 1)	3.5	-0.0041	0.986	0.957	1.016	0.361
SO_2 (lag 2)	3.5	-0.0145	0.951	0.921	0.981	0.002
SO_2 (lag 3)	3.5	-0.0118	0.960	0.930	0.990	0.009
SO_2 (lag 4)	3.5	-0.0133	0.955	0.925	0.985	0.004
SO_2 (lag 5)	3.5	-0.0191	0.935	0.907	0.965	<.0001

Seattle and Damage Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-1.9647	0.675	0.618	0.737	<.0001
CO (lag 1)	0.2	-0.2605	0.949	0.873	1.032	0.224
CO (lag 2)	0.2	-0.53	0.899	0.829	0.976	0.011
CO (lag 3)	0.2	-0.4912	0.906	0.836	0.983	0.017
CO (lag 4)	0.2	-0.4485	0.914	0.843	0.992	0.031
CO (lag 5)	0.2	-1.0247	0.815	0.758	0.875	<.0001
O_3	0.013	-4.4766	0.943	0.867	1.026	0.176
O_3 (lag 1)	0.013	-6.661	0.917	0.845	0.995	0.039
O_3 (lag 2)	0.013	-3.65	0.954	0.881	1.032	0.242
O_3 (lag 3)	0.013	1.4213	1.019	0.940	1.103	0.650
O_3 (lag 4)	0.013	-4.1061	0.948	0.875	1.027	0.190
O_3 (lag 5)	0.013	2.3895	1.032	0.959	1.110	0.407
$PM_{2.5}$	4.18	0.049	1.227	1.142	1.318	<.0001
$PM_{2.5}$ (lag 1)	4.18	0.0253	1.111	1.037	1.192	0.003
$PM_{2.5}$ (lag 2)	4.18	-0.0055	0.977	0.912	1.048	0.518
$PM_{2.5}$ (lag 3)	4.18	-0.0032	0.987	0.920	1.059	0.709
$PM_{2.5}$ (lag 4)	4.18	0.0079	1.034	0.964	1.108	0.356
$PM_{2.5}$ (lag 5)	4.18	-0.0127	0.948	0.893	1.007	0.082
SO_2	3.5	-0.0075	0.974	0.942	1.008	0.131
SO_2 (lag 1)	3.5	-0.004	0.986	0.954	1.019	0.405
SO_2 (lag 2)	3.5	-0.0087	0.970	0.939	1.003	0.072
SO_2 (lag 3)	3.5	-0.0101	0.965	0.933	0.999	0.042
SO_2 (lag 4)	3.5	-0.0076	0.974	0.941	1.007	0.127
SO_2 (lag 5)	3.5	-0.0191	0.935	0.905	0.967	<.0001

Seattle and Disorderly Conduct Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-3.874	0.461	0.274	0.776	0.004
CO (lag 1)	0.2	1.879	1.456	0.920	2.306	0.109
CO (lag 2)	0.2	0.036	1.007	0.635	1.597	0.976
CO (lag 3)	0.2	-0.585	0.890	0.551	1.436	0.632
CO (lag 4)	0.2	0.316	1.065	0.649	1.747	0.803
CO (lag 5)	0.2	-1.940	0.678	0.439	1.048	0.080
O_3	0.013	-0.775	0.990	0.599	1.636	0.969
O_3 (lag 1)	0.013	-26.931	0.705	0.423	1.173	0.178
O_3 (lag 2)	0.013	13.042	1.185	0.726	1.933	0.497
O_3 (lag 3)	0.013	-8.918	0.891	0.557	1.424	0.629
O_3 (lag 4)	0.013	-9.920	0.879	0.537	1.438	0.607
O_3 (lag 5)	0.013	2.109	1.028	0.665	1.588	0.902
$PM_{2.5}$	4.18	0.069	1.335	0.928	1.921	0.119
$PM_{2.5}$ (lag 1)	4.18	0.146	1.837	1.330	2.538	0.000
$PM_{2.5}$ (lag 2)	4.18	0.001	1.005	0.698	1.448	0.976
$PM_{2.5}$ (lag 3)	4.18	-0.045	0.828	0.567	1.208	0.327
$PM_{2.5}$ (lag 4)	4.18	0.083	1.412	0.999	1.996	0.051
$PM_{2.5}$ (lag 5)	4.18	-0.021	0.918	0.657	1.283	0.616
SO_2	3.5	0.0002	1.001	0.802	1.248	0.995
SO_2 (lag 1)	3.5	0.034	1.126	0.968	1.310	0.124
SO_2 (lag 2)	3.5	0.0431	1.163	1.004	1.347	0.045
SO_2 (lag 3)	3.5	-0.049	0.842	0.657	1.080	0.176
SO_2 (lag 4)	3.5	-0.0086	0.970	0.773	1.217	0.795
SO_2 (lag 5)	3.5	0.0028	1.010	0.823	1.239	0.925

Seattle and Harassment Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-2.23	0.641	0.560	0.733	<.0001
CO (lag 1)	0.2	-0.57	0.893	0.787	1.013	0.080
CO (lag 2)	0.2	-0.29	0.943	0.834	1.066	0.347
CO (lag 3)	0.2	-0.32	0.938	0.830	1.059	0.301
CO (lag 4)	0.2	-0.52	0.900	0.796	1.019	0.096
CO (lag 5)	0.2	-1.081	0.806	0.724	0.897	<.0001
O_3	0.013	-10.66	0.871	0.776	0.976	0.018
O_3 (lag 1)	0.013	-6.03	0.925	0.827	1.034	0.169
O_3 (lag 2)	0.013	-1.96	0.975	0.875	1.086	0.645
O_3 (lag 3)	0.013	6.09	1.082	0.971	1.206	0.152
O_3 (lag 4)	0.013	-13.68	0.837	0.752	0.932	0.001
O_3 (lag 5)	0.013	6.50	1.088	0.985	1.203	0.097
$PM_{2.5}$	4.18	0.04	1.200	1.082	1.331	0.001
$PM_{2.5}$ (lag 1)	4.18	0.0125	1.054	0.953	1.165	0.306
$PM_{2.5}$ (lag 2)	4.18	-0.0075	0.969	0.879	1.069	0.532
$PM_{2.5}$ (lag 3)	4.18	0.0084	1.036	0.939	1.142	0.481
$PM_{2.5}$ (lag 4)	4.18	-0.0017	0.993	0.901	1.095	0.889
$PM_{2.5}$ (lag 5)	4.18	-0.0139	0.944	0.869	1.025	0.166
SO_2	3.5	-0.009	0.969	0.924	1.016	0.187
SO_2 (lag 1)	3.5	-0.0043	0.985	0.942	1.031	0.513
SO_2 (lag 2)	3.5	-0.0096	0.967	0.925	1.012	0.146
SO_2 (lag 3)	3.5	-0.0232	0.922	0.879	0.967	0.001
SO_2 (lag 4)	3.5	0.0036	1.013	0.970	1.058	0.565
SO_2 (lag 5)	3.5	-0.0157	0.947	0.905	0.990	0.016

Seattle and Homicide Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-3.97	0.452	0.223	0.918	0.028
CO (lag 1)	0.2	1.13	1.254	0.650	2.416	0.500
CO (lag 2)	0.2	1.74	1.415	0.734	2.728	0.300
CO (lag 3)	0.2	-2.14	0.652	0.341	1.246	0.196
CO (lag 4)	0.2	-0.53	0.899	0.530	1.523	0.691
CO (lag 5)	0.2	1.45	1.336	0.886	2.014	0.168
O_3	0.013	-15.08	0.822	0.396	1.708	0.600
O_3 (lag 1)	0.013	-15.16	0.821	0.404	1.668	0.586
O_3 (lag 2)	0.013	2.36	1.031	0.526	2.020	0.929
O_3 (lag 3)	0.013	-19.84	0.773	0.390	1.530	0.460
O_3 (lag 4)	0.013	28.64	1.451	0.730	2.885	0.288
O_3 (lag 5)	0.013	-43.28	0.570	0.315	1.030	0.063
$PM_{2.5}$	4.18	0.05	1.237	0.725	2.110	0.436
$PM_{2.5}$ (lag 1)	4.18	-0.01	0.958	0.546	1.682	0.882
$PM_{2.5}$ (lag 2)	4.18	0.06	1.263	0.755	2.112	0.373
$PM_{2.5}$ (lag 3)	4.18	-0.02	0.914	0.543	1.539	0.735
$PM_{2.5}$ (lag 4)	4.18	-0.05	0.821	0.497	1.357	0.442
$PM_{2.5}$ (lag 5)	4.18	0.11	1.560	1.102	2.210	0.012
SO_2	3.5	-0.004	0.986	0.727	1.336	0.928
SO_2 (lag 1)	3.5	0.0037	1.013	0.766	1.339	0.927
SO_2 (lag 2)	3.5	-0.0472	0.848	0.596	1.207	0.359
SO_2 (lag 3)	3.5	0.0276	1.101	0.846	1.434	0.473
SO_2 (lag 4)	3.5	-0.0999	0.705	0.450	1.105	0.127
SO_2 (lag 5)	3.5	-0.0065	0.978	0.720	1.327	0.884

Seattle and Motor Vehicle Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-1.287	0.773	0.710	0.841	<.0001
CO (lag 1)	0.2	-0.123	0.976	0.897	1.062	0.567
CO (lag 2)	0.2	-0.268	0.948	0.873	1.029	0.203
CO (lag 3)	0.2	-0.450	0.914	0.842	0.992	0.032
CO (lag 4)	0.2	-0.023	0.995	0.918	1.080	0.913
CO (lag 5)	0.2	-0.464	0.911	0.851	0.976	0.008
O_3	0.013	-2.823	0.964	0.880	1.056	0.429
O_3 (lag 1)	0.013	-2.761	0.965	0.883	1.054	0.428
O_3 (lag 2)	0.013	-3.583	0.954	0.875	1.041	0.292
O_3 (lag 3)	0.013	-0.717	0.991	0.908	1.081	0.834
O_3 (lag 4)	0.013	-2.741	0.965	0.885	1.053	0.422
O_3 (lag 5)	0.013	-2.977	0.962	0.888	1.042	0.341
$PM_{2.5}$	4.18	0.0409	1.186	1.096	1.284	<.0001
$PM_{2.5}$ (lag 1)	4.18	0.0082	1.035	0.959	1.117	0.379
$PM_{2.5}$ (lag 2)	4.18	-0.0023	0.990	0.919	1.068	0.804
$PM_{2.5}$ (lag 3)	4.18	0.0023	1.010	0.935	1.089	0.809
$PM_{2.5}$ (lag 4)	4.18	0.004	1.017	0.942	1.097	0.669
$PM_{2.5}$ (lag 5)	4.18	-0.0045	0.981	0.920	1.047	0.563
SO_2	3.5	-0.011	0.962	0.928	0.998	0.037
SO_2 (lag 1)	3.5	-0.0066	0.977	0.944	1.012	0.189
SO_2 (lag 2)	3.5	-0.0133	0.955	0.922	0.989	0.009
SO_2 (lag 3)	3.5	-0.009	0.969	0.936	1.004	0.078
SO_2 (lag 4)	3.5	-0.0139	0.953	0.918	0.988	0.009
SO_2 (lag 5)	3.5	-0.0172	0.942	0.909	0.975	0.0008

Seattle and Robbery Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-1.479	0.744	0.678	0.816	<.0001
CO (lag 1)	0.2	-0.355	0.931	0.850	1.020	0.127
CO (lag 2)	0.2	-0.271	0.947	0.867	1.035	0.231
CO (lag 3)	0.2	-0.275	0.947	0.867	1.034	0.222
CO (lag 4)	0.2	-0.346	0.933	0.855	1.019	0.122
CO (lag 5)	0.2	-0.349	0.933	0.867	1.004	0.063
O_3	0.013	-4.163	0.947	0.865	1.038	0.246
O_3 (lag 1)	0.013	-6.419	0.920	0.841	1.006	0.067
O_3 (lag 2)	0.013	0.022	1.000	0.917	1.091	0.995
O_3 (lag 3)	0.013	-2.146	0.972	0.891	1.061	0.532
O_3 (lag 4)	0.013	0.102	1.001	0.918	1.092	0.976
O_3 (lag 5)	0.013	-4.831	0.939	0.867	1.017	0.121
$PM_{2.5}$	4.18	0.045	1.204	1.116	1.300	<.0001
$PM_{2.5}$ (lag 1)	4.18	0.014	1.059	0.984	1.141	0.125
$PM_{2.5}$ (lag 2)	4.18	0.004	1.018	0.946	1.094	0.640
$PM_{2.5}$ (lag 3)	4.18	-0.004	0.983	0.913	1.059	0.655
$PM_{2.5}$ (lag 4)	4.18	0.007	1.028	0.956	1.104	0.466
$PM_{2.5}$ (lag 5)	4.18	0.003	1.012	0.952	1.076	0.701
SO_2	3.5	0.002	1.007	0.973	1.042	0.705
SO_2 (lag 1)	3.5	-0.006	0.978	0.944	1.013	0.219
SO_2 (lag 2)	3.5	-0.012	0.959	0.925	0.994	0.022
SO_2 (lag 3)	3.5	-0.006	0.980	0.946	1.015	0.257
SO_2 (lag 4)	3.5	-0.013	0.956	0.921	0.992	0.016
SO_2 (lag 5)	3.5	-0.0093	0.968	0.935	1.002	0.065

Seattle and Theft Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-1.801	0.698	0.648	0.751	<.0001
CO (lag 1)	0.2	-0.464	0.911	0.849	0.978	0.0103
CO (lag 2)	0.2	-0.507	0.904	0.843	0.968	0.004
CO (lag 3)	0.2	-0.543	0.897	0.838	0.961	0.0019
CO (lag 4)	0.2	-0.449	0.914	0.853	0.979	0.0104
CO (lag 5)	0.2	-0.799	0.852	0.803	0.905	<.0001
O_3	0.013	-2.755	0.965	0.899	1.035	0.320
O_3 (lag 1)	0.013	-7.056	0.912	0.851	0.978	0.010
O_3 (lag 2)	0.013	-1.525	0.980	0.916	1.049	0.564
O_3 (lag 3)	0.013	0.644	1.008	0.942	1.079	0.808
O_3 (lag 4)	0.013	-3.572	0.955	0.892	1.021	0.178
O_3 (lag 5)	0.013	0.896	1.012	0.951	1.076	0.713
$PM_{2.5}$	4.18	0.055	1.259	1.186	1.337	<.0001
$PM_{2.5}$ (lag 1)	4.18	0.024	1.104	1.041	1.171	0.0009
$PM_{2.5}$ (lag 2)	4.18	-0.008	0.969	0.914	1.028	0.299
$PM_{2.5}$ (lag 3)	4.18	0.003	1.012	0.954	1.074	0.700
$PM_{2.5}$ (lag 4)	4.18	0.001	1.003	0.945	1.063	0.933
$PM_{2.5}$ (lag 5)	4.18	-0.004	0.983	0.935	1.033	0.496
SO_2	3.5	-0.007	0.975	0.947	1.004	0.090
SO_2 (lag 1)	3.5	-0.002	0.994	0.967	1.022	0.692
SO_2 (lag 2)	3.5	-0.013	0.957	0.930	0.985	0.003
SO_2 (lag 3)	3.5	-0.013	0.956	0.928	0.985	0.003
SO_2 (lag 4)	3.5	-0.012	0.961	0.933	0.989	0.008
SO_2 (lag 5)	3.5	-0.017	0.941	0.915	0.968	<.0001

Seattle and Trespass Crimes

Parameter	IQR	Estimate	Risk Ratio	Lower Bound	Upper Bound	P-Value
CO	0.2	-2.286	0.633	0.552	0.726	<.0001
CO (lag 1)	0.2	-0.625	0.882	0.776	1.004	0.057
CO (lag 2)	0.2	-0.331	0.936	0.827	1.059	0.294
CO (lag 3)	0.2	-0.103	0.980	0.867	1.107	0.743
CO (lag 4)	0.2	-0.334	0.935	0.826	1.059	0.291
CO (lag 5)	0.2	-0.864	0.841	0.755	0.937	0.002
O_3	0.013	-10.55	0.872	0.774	0.982	0.024
O_3 (lag 1)	0.013	-4.78	0.940	0.837	1.055	0.293
O_3 (lag 2)	0.013	2.64	1.035	0.926	1.157	0.548
O_3 (lag 3)	0.013	-2.01	0.974	0.871	1.090	0.647
O_3 (lag 4)	0.013	-5.28	0.934	0.835	1.044	0.228
O_3 (lag 5)	0.013	-3.28	0.958	0.865	1.061	0.413
$PM_{2.5}$	4.18	0.050	1.231	1.115	1.360	<.0001
$PM_{2.5}$ (lag 1)	4.18	0.032	1.142	1.038	1.256	0.006
$PM_{2.5}$ (lag 2)	4.18	-0.012	0.953	0.866	1.048	0.318
$PM_{2.5}$ (lag 3)	4.18	0.0089	1.038	0.943	1.142	0.448
$PM_{2.5}$ (lag 4)	4.18	0.0033	1.014	0.922	1.115	0.778
$PM_{2.5}$ (lag 5)	4.18	-0.0052	0.979	0.902	1.061	0.596
SO_2	3.5	-0.004	0.986	0.941	1.033	0.559
SO_2 (lag 1)	3.5	-0.0061	0.979	0.934	1.026	0.369
SO_2 (lag 2)	3.5	-0.0117	0.960	0.916	1.006	0.086
SO_2 (lag 3)	3.5	-0.0054	0.981	0.937	1.028	0.424
SO_2 (lag 4)	3.5	-0.0169	0.943	0.897	0.991	0.021
SO_2 (lag 5)	3.5	-0.0287	0.904	0.861	0.951	<.0001