BROKEN WINDOWS, BROKEN THEORY:
HOW CITY PLANNING ACTUALLY AFFECTS CRIME

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This Note examines the effects urban planning has on crime rates in two cities. The first, Washington, D.C., passed the Legacy Plan in 1997 to improve city aesthetics and revitalize businesses. Neighboring Alexandria, Virginia passed new city planning ordinances in 1992. The differential timing gives rise to a natural experiment for examining the impact of city planning on crime rates. A difference-in-differences analysis is used to compare the effect of the Legacy Plan in Washington, D.C. before and after its adoption, relative to the control jurisdiction of Alexandria during the same period. The difference-in-differences estimation produced one statistically significant result for motor vehicle thefts. There was also an overall decrease in crimes in both cities over the period studied. Recommendations for future research and for practice are discussed.

I. Introduction

The March 1982 issue of *The Atlantic* changed the field of criminology forever. An article introduced Broken Windows Theory to the public, which was partly based on an earlier social science experiment.[1] In 1969, Stanford psychologist Philip Zimbardo conducted a study with two cars he had to spare. He wished to study the effect seeing vandalism had on crime. In the Bronx, a place beset by poverty and crime, he parked the first car on the street unsupervised. He removed the license plates and left the hood up and doors open. The second car was parked in Palo Alto, California like any other car on the street, with the license plates attached and the doors and hood closed. Within ten minutes, the car in the Bronx was vandalized and after three days, there was nothing of value left in the car. However, the car in Palo Alto remained in pristine condition for over a week. Zimbardo sought to prime the public to vandalize the second car, so his research team took a sledgehammer to the window. The car was destroyed within days, much like the first car in the Bronx.

After the publication of the Broken Windows Theory article, the theory gained traction across America, in police departments and in the public sphere. It influenced policy everywhere. If streets could just look clean, vandalism and other low-level crimes would decrease or stop altogether. However, results were mixed, and critics argued this theory only served to increase policing in already marginalized communities of color. Eventually, the theory fell out of vogue when the public discovered the authors of the original article in *The Atlantic* built their evidence by badly misconstruing Zimbardo's results.[2] They omitted an important part of the story about the second car being destroyed. When Zimbardo's research team took the sledgehammer to the window, they had fun. They became carried away and started destroying the car themselves; what was supposed to be one broken window to prime the public became total destruction. Other members of the public did join in and the car was truly destroyed, but only because the researchers themselves initiated and led the vandalism. As awareness of the truth behind this study grew, people realized the flaws of the theory itself and how research and journalism can each become misconstrued and be used in harmful ways.

One of the key goals of government, as understood by the traditional police powers of the state and the law enforcement functions of the federal government, is to prevent crime in the areas overseen by government leaders. Fear of crime is a societal concern, and public safety has been vital to an orderly society for centuries. There are many ways to promote public safety, including legislative attempts to define what crimes are, local law enforcement detecting crime and arresting perpetrators, and the judicial system, where punishments are determined for people who are guilty of breaking the law. However, some governments have sought to deter crime in more fundamental ways, ones that attempt to curb crime before it even occurs. Often this refers to local municipalities and their attempts to lower crime using more creative methods, such as city planning ordinances to influence the physical layout of their cities.

The purpose of this Note is to empirically examine the effect city planning can have on crime rates. First, there will be a discussion of what is already known about how city planning affects crime. This includes a discussion of reports discussing methods to control crime, common

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[1] George L. Kelling & James Q. Wilson, *Broken Windows: The Police and Neighborhood Safety*, The Atlantic, (March 1982), https://www.theatlantic.com/magazine/archive/1982/03/broken-windows/304465/.
[2] Bench Ansfield, *How a 50-year-old study was misconstrued to create destructive broken-windows policing*, The Washington Post, (December 27, 2019), https://www.washingtonpost.com/outlook/2019/12/27/how-year-old-study-was-misconstrued-create-destructive-broken-windows-policing/.

criminological theories, and results of past research on this topic. Next, the methodology and data sources will be discussed, followed by the findings of the study. Finally, the Note will close with a discussion of the findings and how they can be helpful to city planners and planning committees. This includes any conclusions that can be reached from the findings, implications of the research, and recommendations for practice and future empirical studies.

In 1996, the National Institute of Justice issued a report discussing the impact a city's physical environment has on crime.[3] The report sought to understand approaches cities could use during their planning process to reduce crime. The National Institute of Justice assumed that criminals are rational actors who make determinations about the ease of entering the crime scene, the likelihood of being seen, how residents might react if the criminals are caught, and if there is a quick route for exit.[4] The report described four approaches cities could take to reduce crime, assuming that potential offenders are rational. These included: (1) housing design or block layout; (2) land use and circulation patterns; (3) territorial features; and (4) physical deterioration.[5]

The first approach involves housing design and block layouts. The goal of this method is to make it more difficult to commit crimes by: (1) reducing the availability of crime targets; (2) removing barriers that prevent detection of offenders or crimes in progress; and (3) increasing physical obstacles to crime.[6] Through actions such as creating spaces that offer better surveillance, changing the proximity of public and private spaces, and segmenting outdoor space into locations controlled by smaller groups of residents, cities might inhibit crimes performed by rational criminals.[7]

The second approach includes creating safer spaces by reducing the routine exposure of potential criminals to crime targets. This goal is accomplished by paying attention to sidewalks, streets, traffic patterns, and locations and hours of public facilities.[8] For example, revising traffic patterns to decrease street traffic volume may encourage local residents to better maintain the sidewalks and streets in front of and near their homes.[9]

The third approach focuses on encouraging conditions that increase vigilance among residents and the extent to which they mark their own territories to signal their vigilance to would-be perpetrators. This approach works on a primarily residential level.[10] Ideally, sponsoring cleanup and beautification projects in local neighborhoods increases the chance that residents take these tasks on in the future voluntarily.[11] This approach has not proven to directly lower crime, but is closely linked to residents' fear of crime.[12]

The final approach involves controlling physical deterioration, which signals to offenders that areas are susceptible to crime. Fixing and controlling deterioration, such as removing trash and abandoned vehicles from vacant lots, freshly paving roads and sidewalks, and razing or demolishing deteriorated vacant houses, may reduce these signs of vulnerability.[13] This approach

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[3] Ralph B. Taylor & Adele V. Harrell, *Physical Environment and Crime*, Nat'l Inst. of Just. Rsch. Rep., (January 1996), https://www.ncjrs.gov/pdffiles/physenv.pdf.
[4] *Id*. at 2.
[5] *Id*. at 3–4.
[6] *Id*. at 3.
[7] *Id*. at 7.
[8] *Id*. at 3.
[9] *Id*.
[10] *Id*. at 4.
[11] *Id*.
[12] *Id*.
[13] *Id*.

is differentiating from the third in that it usually involves sustained local government action rather than contributions largely from citizens and communities.[14] The projects are typically too large and deterioration too great for citizen groups to undertake them, although they do reap the benefits.[15]

The National Institute of Justice report emphasized that each of these four approaches can work independently of one another, but also have mutually reinforcing effects.[16] For example, changing the traffic patterns surrounding a high crime area while also demolishing vacant, highly deteriorated houses could each separately reduce the number of potential offenders, but together might reduce them even further.[17] The report emphasized, "varying intervention points and levels of intervention may make or encourage physical improvements that may enhance safety and feelings of safety."[18]

II. Theoretical Frameworks

Now we turn to the various theories used in the field of Environmental Criminology to describe how criminal behavior is affected by the physical characteristics of a city. Environmental Criminology is defined as "the study of crime, criminality, and victimization as they relate first to particular places, and secondly, to the way that individuals and organizations shape their activities by their placed-based or spatial factors."[19] Prior research has indicated that crime is not randomly distributed throughout cities, but rather different types of crime cluster at certain locations and certain times.[20] To explain this phenomenon, researchers in the field have identified four theories to help explain the choices potential criminals make when evaluating their surroundings before committing a crime: (1) Broken Windows Theory; (2) Rational Choice Theory; (3) Routine Activities Theory; and (4) Crime Pattern Theory. Each of these theories will be discussed in turn.

Broken Windows Theory was introduced by two social scientists in an article in *The Atlantic* and was popularized in the 1990s by New York City's police commissioner William Bratton and Mayor Rudy Giuliani. The theory proposes that visible signs of crime, anti-social behavior, and civil disorder create an urban environment that encourages further crime and disorder.[21] Further, it suggests that policing methods that target minor crimes, such as vandalism and jay walking, help create an atmosphere of order and lawfulness, which helps to prevent more serious crimes.[22] This theory aligns with research on physical deterioration discussed above. Quite literally, broken windows suggest a lack of care in the neighborhood, which leads criminals to believe the area is less protected by the police or that the citizens living there are accustomed to crime.

Rational Choice Theory argues that most opportunistic criminals are rational in their decision-making and recognize, evaluate, and respond to a variety of environmental cues.[23] These

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[14] *Id.* at 4–5.
[15] *Id.* at 5.
[16] *Id.*
[17] *Id.*
[18] *Id.*
[19] Paul Michael Cozens, *Urban Planning and Environmental Criminology: Towards a New Perspective for Safer Cities*, 26 Plan. Prac. Rsch. 481, 485 (2011).
[20] *Id.*
[21] Kelling, *supra* note 1.
[22] *Id.*
[23] Cozens, *supra* note 19, at 486.

cues relate to the perceived risk, rewards, and effort associated with the offense and are central to the criminal's decision-making process.[24] Existing empirical research supports this theory. However, the support is confined to crimes of opportunity, such as drug and property offenses. If potential offenders find an opportunity to commit a crime but believe there is a high likelihood they will be caught, then they will likely refrain from completing the offense. This theory posits that people choose to engage in crime because it is personally beneficial and exceeds the expected cost of apprehension. Thus, potential offenders can be deterred from committing crimes simply by intensifying the chance they will be punished as well as the severity of the punishment itself.

Routine Activities Theory suggests that a crime requires three elements: a motivated offender, a suitable target, and the absence of capable guardians.[25] Offenders, like most people, have routine activities, such as going to work, attending school, shopping, and seeking entertainment. During these activities, they might discover or search for potential targets.[26] These routine activities form the criminal's "awareness space," where most crimes committed occur.[27] Routine Activities Theory holds that social and economic conditions create the motivation for potential offenders. Criminal activities are normal and dependent on suitable opportunities to act. If an unprotected target exists and there are rewards to be gained by a sufficiently motivated (and risk-loving) potential criminal, they would be expected to commit a criminal act. The expected benefit from unlawful behavior also depends on one's assessment of the target's vulnerability. The more suitable and accessible a target is, the more likely the potential criminal will discount the risk from attempting and completing the crime. Finally, the presence of capable guardians helps deter individuals from committing crimes. Guardianship may be the physical presence of a person who can act protectively. It also includes passive measures, such as installing and operating security cameras. Because motivation, opportunity, and targets set the stage for someone considering criminality, the presence of guardians might deter the potential criminal from taking the first step toward targets. Conversely, when guardianship is lacking, the availability of a target (combined with the potential criminal's motivation and the opportunity for taking advantage of the target) increases the likelihood of a crime occurring.

Crime Pattern Theory seeks out patterns in the selection processes used by criminals.[28] The authors of the theory noted two patterns. First, crimes against persons usually take place at home or around drinking establishments.[29] Second, crimes against property usually occur at or near activity nodes and where people congregate, such as shopping centers, sports areas, parks, and the routes leading to these places.[30] Research based on this theory has determined some of the riskiest settings are: public paths (e.g., sidewalks, parking facilities), recreational settings (e.g., bars and some parks), human support services (e.g., 24-hour hospitals), and industrial locations (e.g., warehouses with "attractive" goods).[31]

An extension of Crime Pattern Theory is situational crime prevention (SCP). SCP uses the physical aspects of Crime Pattern Theory, but focuses on current specific crime problems, rather than attempting to prevent crime issues in new developments.[32] SCP operates on a micro-scale and

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[24] *Id.*
[25] *Id.*
[26] *Id.* at 486-87.
[27] *Id.* at 487.
[28] *Id.*
[29] *Id.*
[30] *Id.*
[31] *Id.*
[32] *Id.* at 487–88.

is crime-specific.[33] This prevention technique is broader than the previous theories in that it extends past opportunity to include environmental temptations and provocations.[34] SCP predicts four ways the environment might exacerbate criminal behavior. First, environmental cues can prompt criminal activity. Second, social forces can put pressure on individuals to promote committing crime.[35] Third, situational factors can lower moral inhibitions and permit criminal behavior. Fourth, the immediate environment can provoke crime.[36]

Finally, the originators of Crime Pattern Theory coined the phrase "environmental backcloth," which refers to, "the uncountable elements that surround and are part of an individual . . . [which] would also explicitly include the physical infrastructure of buildings, roads, transit systems, land uses, design and architecture, as well as the people located within that physical infrastructure."[37] In essence, the environmental backcloth is the collection of physical features in an area and their influence on people in the area. For example, if a bus stop sits on a part of the sidewalk with poor lighting and no nearby security features, it will likely foster opportunities for crimes to occur against people waiting there. This environmental backcloth also influences routes taken to routine activities.[38] Knowledge of the physical characteristics of certain routes or areas leads citizens to choose routes based on this knowledge and their beliefs. If they believe one route is safer than another, they will prioritize taking the safer route to their destination.

In addition to these four theories, researchers have developed three theoretical assumptions about preventing crime: permeable street configurations, mixed-use developments, and high densities.[39] There are two competing perspectives with regard to street permeability: the "encounter" model and the "enclosure" model.[40] The encounter model posits that permeable streets are safer because they encourage walking, social interaction, and more people to provide eyes on the street.[41] This model encourages the presence of as many people in public areas as possible, especially benevolent strangers, because they can informally police spaces.[42] On the other hand, the "enclosure" model argues that limiting permeability, through controlling access to strangers, means that residents can more easily distinguish benevolent strangers and potential criminals, which helps to reduce crime.[43]

The remaining two assumptions are more settled and widely accepted. There is a consensus that mixed land uses are more desirable than purely residential areas.[44] This planning model enables residents to have services and other facilities near their homes, which are assumed to increase activity and eyes on the street throughout the day. Those factors in turn increase community safety and reduce crime.[45] Similarly, living in a high-density area provides similar

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[33] *Id.* at 488.
[34] *Id.*
[35] *Id.*
[36] *Id.*
[37] *Id.* (quoting Patricia L. Brantingham & Paul J. Brantingham, *Nodes, paths, and edges: Considerations on the complexity of crime and the physical environment*, 13 J. ENVTL. PSYCH. 3, 6–7 (1993)).
[38] *Id.* at 9.
[39] *Id.* at 490.
[40] *Id.*
[41] *Id.* at 491.
[42] *Id.*
[43] *Id.*
[44] *Id.* at 492.
[45] *Id.*

benefits as the mixed-use areas and contributes to a strong local identity among the people who live there, which assists in reducing crime.[46]

III. An Empirical Analysis of Urban Planning and Crime

The question guiding the research in this Note is, "What effect does urban planning have on crime rates in cities that have implemented beautification plans?" Past research on city planning effects have examined the many types of changes cities can make to potentially reduce crime. However, none of these studies have looked specifically at beautification plans like the Legacy Plan. Because beautification plans inherently only seek to modify aesthetics, studying them can help explain their unintended effects on crime. This is an issue not addressed in previous research that could be helpful to city planners in the future.

A. Study Background

For this empirical study, Washington, D.C. and Alexandria, Virginia were selected as two comparison cities. Both cities are located on the East Coast of the United States and are geographically similar. Alexandria passed a series of amendments to its city planning ordinances in 1992, but generally avoided massive changes to its city landscape.[47] On the other hand, Washington, D.C. passed the Legacy Plan in 1997.[48] The Legacy Plan was a sweeping reform of the District's layout. Thus, Alexandria was chosen as the control unit and Washington, D.C. served as the treated unit for the purposes of the analysis, described in the next section.

In June 1992, Alexandria passed the Master Plan of the City of Alexandria, Virginia.[49] The stated goals of the plan included: (1) having a quantum of land that preserves the predominant character of Alexandria as a city of residences, businesses, and community facilities, and that maintains a robust economic base; (2) preserving and enhancing residential neighborhoods; (3) maintaining and enhancing the historic aspect of the city; (4) protecting the residential and commercial diversity that has historically characterized Alexandria; and (5) preserving and increasing parkland (for active and passive uses) and open space throughout the city.[50] Crime was only referenced in the document regarding goals and objectives and was limited to discussing the Alexandria Police Department and the city's goals for public safety.[51] There were no general or specific goals related to crime reduction in particular.

According to the FBI's Uniform Crime Report for 1995, Alexandria had a population of 114,015 people.[52] The FBI assigns each city a Modified Crime Index, which is the sum of the eight categories of crime collected by the FBI each year (murder and non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, motor vehicle theft, and arson).

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[46] *Id.*

[47] *See generally* City of Alexandria, Virginia, *Alexandria Master Plan & Citywide Chapters*, https://www.alexandriava.gov/planning/info/default.aspx?id=44614.

[48] *See* Nat'l Cap. Plan. Comm'n, *Extending the Legacy: Planning America's Capital for the 21st Century*, https://www.ncpc.gov/docs/Extending_the_Legacy_Plan_full.pdf.

[49] City of Alexandria, *supra* note 47.

[50] City of Alexandria, *Alexandria Master Plan & Citywide Chapters: Goals & Objectives*, https://www.alexandriava.gov/uploadedFiles/planning/info/masterplan/masterplan_goals_objectives_pt%202.pdf.

[51] *Id.* at 18.

[52] Fed. Bureau of Investigation, *Crime in the United States -1995: Section II – Crime Index Offenses Reported*, 5, 145, https://ucr.fbi.gov/crime-in-the-u.s/1995/95sec2.pdf.

Alexandria's Crime Index was 7,418 in 1995.[53] By 2003, Alexandria's population had grown to 132,468, but its Modified Crime Index had dropped to 4,718.[54]

Several years later, the National Capital Planning Commission passed the Legacy Plan to revitalize Washington, D.C.[55] This broad, sweeping plan sought to completely rejuvenate the physical environment of Washington, D.C. The stated goals of the Legacy Plan included: (1) incorporating the Potomac and Anacostia Rivers into the District's public life; (2) developing a comprehensive, flexible, and convenient transportation system to eliminate barriers and improve movement in the city; (3) using new memorials, museums, and other public buildings to stimulate economic development; and (4) generally unifying the District and the Monumental Core, with the Capitol at the center.[56] Similar to Alexandria, crime was not at all mentioned in the text of the Legacy Plan and no stated goals discussed crime reduction. Congress later approved amendments to the original Legacy Plan, including the Memorials and Museums Master Plan in 2003.[57]

In 1995, Washington, D.C. boasted a population of 554,000.[58] The Modified Crime Index for that year was 67,524.[59] By 2003, Washington, D.C.'s population had grown to 563,384 and the District had a Modified Crime Index of 40,420.[60]

B. Methodology

A difference-in-differences (DID) analysis was conducted to examine the effects of the Washington, D.C. Legacy Plan, if any, on the incidence of crime in the District, using Alexandria's plan as a control experience. A DID analysis is a quasi-experimental design that uses longitudinal data from control and treated groups to estimate a causal effect.[61] A DID analysis is typically used to estimate the effect of a specific intervention (such as the passage of a law or enactment of a program) by comparing changes over time between the control group and the treated group.[62] In this study, the empirical analysis compares changes in crime rates in both cities over the same time period to determine if the urban planning intervention in Washington, D.C. affected the District's crime rate to a statistically significant degree when compared to any changes in the non-intervention city, Alexandria.

A DID analysis compares two different groups before and after a treatment or intervention. The analysis compares the changes in the treated group to changes in the control group over the same time period. If key independent variables are statistically significant, we can infer that the treatment itself is the cause of the change. This is because the analysis calculates the effect of the treatment itself on the changes occurring before and after its implementation.

Washington, D.C. and Alexandria were selected for several reasons. Washington, D.C. and Alexandria are geographically close and have similar populations. Their geographical proximity

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[53] *Id.*

[54] Fed. Bureau of Investigation, *Crime in the United States - 2003: Section II – Crime Index Offenses Reported*, 9, 175, https://ucr.fbi.gov/crime-in-the-u.s/2003/03sec2.pdf.

[55] Nat'l; Cap. Plan. Comm'n, *supra* note 48.

[56] *Id.* at 10.

[57] Nat'l Cap. Plan. Comm'n, *Memorials & Museums Master Plan*, https://www.ncpc.gov/plans/memorials/.

[58] Fed. Bureau of Investigation, *supra* note 52, at 115.

[59] *Id.*

[60] Fed. Bureau of Investigation, *supra* note 54, at 140.

[61] Joshua D. Angrist & Jorn-Steffen Pischke, *Mostly Harmless Econometrics: An Empiricist's Companion* (2009).

[62] Columbia Univ. Dep't of Pub. Health, *Difference-in-Difference Estimation*, https://www.publichealth.columbia.edu/research/population-health-methods/difference-difference-estimation.

means that, although the cities have different population sizes, they likely share very similar demographic profiles. In fact, the two populations intersect heavily in ways that blur the official border between them. People may commute in both directions between the jurisdictions for work or send their children to schools in the other location. One confounding factor might be that Alexandria approved their own city plan several years before Washington, D.C. There are a sufficient number of years, however, between the implementation of each plan that any effects of Alexandria's plan should have stabilized before the Legacy Plan went into effect. Finally, neither plan set an explicit goal of using city planning to reduce crime, which allows for a richer analysis of the inadvertent effects city planning can have on crime rates.

Data were collected from the FBI's annual Uniform Crime Report for the years 1991 through 1996 for the pre-treatment period and 1997 through 2003 for the post-treatment period.[63] These years were selected in order to have adequate data to compare crime information pre- and post-treatment. The year 2003 was chosen as the end date because this was the year Congress approved the first major amendment to the original Legacy Plan, which signaled the start of a new phase in Washington D.C. city planning. In addition, data were sorted into two categories and then aggregated in order to examine the effects city planning might have on certain types of crime. The two categories were crimes against persons (murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault) and crimes against property (burglary, larceny-theft, motor vehicle theft, and arson).

1. Data Collection

Data were collected through the Federal Bureau of Investigation's (FBI) annual Uniform Crime Report (UCR).[64] The UCR data include all reported crimes disaggregated into categories for each calendar year, as well as the Crime Index for each year, which, again, is the sum of all categories of crime committed during each year.[65] The UCR also includes a Persons Index and Property Index to reflect the sum of each subtype of crime.

The years 1991-1996 were chosen for the pre-treatment years and 1997-2003 were used as the post-treatment years. In a DID analysis, the treatment year is included in the post-treatment side of the analysis. For unknown reasons, Alexandria was omitted from the FBI's Uniform Crime Report for years 2000 and 2001.[66] Post-treatment data for those years in Alexandria were not available or used in any analysis. To complete the analysis, the Autofill function of Microsoft Excel was used to create data for those two years in Alexandria. The following tables summarize the types of crimes committed in each city pre- and post-treatment.

2. Assumptions

To statistically estimate a causal effect using DID methodology, three assumptions must hold: exchangeability, positivity, and the Stable Unit Treatment Value Assumption (SUTVA).[67] Exchangeability refers to the control group's similarity to the treated group. Exchangeability

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[63] *See generally* Fed. Bureau of Investigation, Criminal Justice Information Services, https://www.fbi.gov/services/cjis/ucr/publications.
[64] *Id.*
[65] *Id.*
[66] *Id.*
[67] Columbia Univ. Dep't of Pub. Health, *supra* note 62.

between groups is achieved when groups are similar for all measured and unmeasured confounders. Positivity requires there to be both treated and untreated individuals or groups in the population of the study. SUTVA has two major components. First, that units do not interfere with each other; in other words, treatment applied to one does not affect the other. Second, there is only a single version of each treatment level. In addition, DID estimation also requires that the intervention is unrelated to the outcome at baseline, i.e., allocation of the intervention was not determined by the outcome; treated and control groups had "parallel trends" in the outcome before the intervention; the composition of the treated and comparison groups is stable for repeated cross-sectional design (part of SUTVA); and there are no spillover effects (part of SUTVA).[68]

The parallel trend assumption is the most important assumption of the four listed above.[69] This ensures internal validity of the DID model and is the hardest assumption to fulfill.[70] It requires that without the treatment, the difference between the treated and control groups is constant over time.[71] There is no standard statistical test to measure this assumption, so visual inspection of individual variables is necessary.[72] Violating the parallel trends assumption leads to biased estimation of the causal effect.[73] To test this assumption, the variables of rape and motor vehicle theft were graphed and inspected visually.

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[68] *Id.*
[69] *Id.*
[70] *Id.*
[71] *Id.*
[72] *Id.*
[73] *Id.*

IV. Results

Table 1. Washington D.C. Pre-Treatment Crimes (1991 – 1996)

Years	Murder/Non-negligent Homicide	Rape	Robbery	Aggravated Assault	Burglary	Larceny	Motor Vehicle Theft	Crime Index
1991	482	214	7,265	6,704	12,403	29,119	8,132	78,984
1992	443	215	7,456	8,566	10,719	30,618	9,117	67,134
1993	454	324	7,107	9,003	11,532	31,466	8,060	67,946
1994	399	249	6,311	8,218	10,037	29,673	8,257	63,144
1995	360	292	6,864	7,228	10,184	32,281	10,192	82,145
1996	397	260	6,444	6,310	9,828	31,343	9,975	77,968

Table 2. Alexandria, Virginia Pre-Treatment Crimes (1991 – 1996)

Years	Murder/Non-negligent Homicide	Rape	Robbery	Aggravated Assault	Burglary	Larceny	Motor Vehicle Theft	Crime Index
1991	7	43	405	275	1,358	5,373	1,038	8,499
1992	4	35	397	311	931	4,729	1,137	7,544
1993	9	33	376	334	921	5,682	969	8,324
1994	9	37	317	342	1,042	4,696	874	7,317
1995	2	30	291	331	934	4,647	1,183	7,418
1996	7	45	318	266	945	4,615	947	7,143

Table 3. Washington, D.C. Post-Treatment Crimes (1997 – 2003)

Years	Murder/Non-negligent Homicide	Rape	Robbery	Aggravated Assault	Burglary	Larceny	Motor Vehicle Theft	Crime Index
1997	301	218	4,499	5,688	6,963	26,748	7,569	51,986
1998	260	190	3,606	4,932	6,361	24,321	6,501	55,159
1999	241	248	3,344	4,615	5,067	21,673	6,652	55,159
2000	239	251	3,553	4,582	4,745	21,637	6,600	50,232
2001	232	188	3,940	5,568	5,009	21,434	7,670	53,969
2002	264	262	3,731	4,854	5,167	20,903	9,168	53,460
2003	248	273	3,836	4,482	4,670	17,362	9,549	49,259

Table 4. Alexandria, Virginia Post-Treatment Crimes (1997 – 2003)

Years	Murder/Non-negligent Homicide	Rape	Robbery	Aggravated Assault	Burglary	Larceny	Motor Vehicle Theft	Crime Index
1997	5	46	267	288	819	4,363	813	6,601
1998	7	39	202	241	790	4,038	743	6,060
1999	2	22	158	206	556	4,036	702	5,682
2000	4*	34*	154*	234*	594*	3,842*	704*	5,566*
2001	4*	33*	124*	223*	529*	3,673*	658*	5,244*
2002	3	21	176	212	482	3,532	739	5,165
2003	3	25	169	208	429	3,253	610	4,697

*Data Unavailable via FBI reports. Data were estimated using Microsoft Excel's Autofill feature.

Tables 1 through 4 disseminate the raw number of crimes reported in seven categories. Generally, there was a downward trend in each crime in both cities across both time periods. As an example, in Washington, D.C., the highest number of murders or non-negligent homicides in a single year was in 1991 with 482 murders and homicides. The lowest year was 2001 with only 232, a difference of 250 crimes in that category. In Alexandria, 1993 and 1994 were tied for the highest years, with nine murders each. The lowest years

were 1995 and 1999, with two murders and homicides each, for a difference of seven. Similarly, the difference in Washington D.C.'s rape crimes was 136, robberies was 4,112, aggravated assaults was 4,521, burglaries was 7,733, larcenies was 14,919, and motor vehicle thefts was 3,691. The difference in Alexandria's rape crimes was 25, robberies was 247 (the two lowest on the table were generated by Excel and omitted for this part of the analysis), aggravated assaults was 136, burglaries was 929, larcenies was 2,120, and motor vehicle thefts was 573.

Tables 5 and 6 summarize the persons, property, and crime indexes for Washington, D.C. and Alexandria, Virginia respectively. The Persons Index represents the sum of all crimes against persons (murder & non-negligent manslaughter, rape, robbery, and aggravated assault) for each year. The Property Index is the sum of all crimes against others' property (burglary, larceny, and motor vehicle theft) for each year. The Crime Index is the sum of all reported crimes for each year.

Table 5. Washington, D.C. Summary of Persons, Property, and Crime Indexes (1991 – 2003)

Year	Persons Index	Property Index	Crime Index
1991	14,665	49,654	64,319
1992	16,680	50,454	67,134
1993	16,888	51,058	67,946
1994	15,177	47,967	63,144
1995	14,744	52,657	67,401
1996	13,411	51,146	64,557
1997	10,706	41,280	51,986
1998	8,988	37,183	46,171
1999	8,448	33,392	41,840
2000	8,625	32,982	41,607
2001	9,928	34,113	44,041
2002	9,111	35,238	44,349
2003	8,839	31,581	40,420

Table 6. Alexandria, Virginia Summary of Persons, Property, and Crime Indexes (1991 – 2003)

Year	Persons Index	Property Index	Crime Index
1991	730	7,812	8,542
1992	747	6,797	7,544
1993	752	7,572	8,324
1994	705	6,612	7,317
1995	654	6,785	7,439
1996	636	6,521	7,157
1997	606	5,995	6,601
1998	489	5,589	6,078
1999	388	5,306	5,694
2000	426*	5,140*	5,566*
2001	384*	4,860*	5,244*
2002	412	4,769	5,181
2003	405	4,313	4,718

*Data Unavailable. Data created through Autofill function of Microsoft Excel.

Tables 5 through 6 demonstrate the overall trends in types of crime in Washington, D.C. and Alexandria. Generally, all types of crime decreased over the time period in both geographic areas. Both cities experienced decreases over time in crimes against persons and crimes against property. In Washington, D.C., the highest year in total reported crimes was 1993 with 67,946 and dropped to its lowest in the period in 2003 with 40,420, a difference of 27,526 fewer crimes. In Alexandria, the highest year was 1991 with 8,542 crimes reported and the lowest was in 2003 with 4,718 for a decrease of 3,824 fewer crimes reported.

A DID analysis was conducted to test the statistical significance of the Legacy Plan's impact. The analysis is summarized in Table 7 below. Imputed data were utilized for Alexandria for the years 2000 and 2001 because those years were not provided in the UCR. To do this, Microsoft Excel's Autofill feature was utilized to complete the missing years using the data that did exist for other years.

Table 7. Summary of Difference-in-Differences Analysis

Crime Type	Coefficient	p-value	Statistically Significant?
Murder	0.04	0.89	No
Rape	0.21	0.23	No
Robbery	0.21	0.13	No
Aggravated Assault	-0.01	0.91	No
Burglary	-0.02	0.88	No
Larceny	0.04	0.69	No
Motor Vehicle Theft	0.33	0.004	Yes

Table 7 describes the results of the DID analysis. The coefficient is the interaction of the time variable and the Legacy Plan treatment. In other words, this number is the comparison of the changes over time in Washington, D.C. compared to Alexandria. It measures the effect the treatment had on crime rates. For example, the coefficient for murder and for larceny is 0.04. This indicates the Legacy Plan increased the rate of murders and crimes considered larceny in Washington, D.C. by approximately four percent when comparing the time period before and after treatment to the same changes in Alexandria. We are able to draw this conclusion because the dependent variable has been transformed using the natural log to produce a more interpretable number. Similarly, the Legacy Plan caused a 21 percent increase in both rape crimes and robberies, a one percent decrease in aggravated assaults, and a two percent decrease in burglaries. However, none of these changes are considered statistically significant, meaning we cannot precisely state they were caused by the Legacy Plan itself. There are likely other, currently unknown or omitted variables driving these changes, or the changes could be attributed to randomness.

The p-value tells us if the resulting change is statistically significant. Generally, a p-value less than or equal to 0.05 indicates statistical significance. Here, the p-values for these not significant variables range from 0.13 for robberies to 0.91 for aggravated assaults. The specific values themselves are not important, but each of them indicates the variables associated with them are not significant and the Legacy Plan did not affect that type of crime to a significant degree.

The analysis did produce one significant variable: motor vehicle thefts. Based on the findings from the DID analysis, motor vehicle thefts in Washington D.C. increased by approximately 33 percent after the implementation of the Legacy Plan compared to Alexandria across the same time period. The *p*-value associated with motor vehicle thefts is 0.004, which means the Legacy Plan did significantly affect this type of crime.

The changes before and after the intervention (Legacy Plan adoption) for both Alexandria and Washington, D.C. were also calculated. These changes are summarized in Table 8 below.

Table 8. Changes in Alexandria and Washington, D.C. Before and After Treatment

Crime Type	Washington, D.C.	Alexandria
Murder	-0.46	-0.50
Rape	-0.06	-0.27
Robbery	-0.27	-0.77
Aggravated Assault	-0.39	-0.38
Burglary	-0.64	-0.62
Larceny	-0.30	-0.34
Motor Vehicle Theft	-0.11	-0.44

As shown in Table 8, all types of crime fell after treatment in both Washington, D.C. and Alexandria. Unlike in Table 7, where the degrees of changes were being measured between the two cities, Table 8 provides a summary of the changes in terms of raw numbers. In other words, it shows how much actual crime fell in each category. Based on the analysis, murders fell 46 percent in Washington, D.C. and 50 percent in Alexandria. Rape crimes fell six percent in Washington, D.C. and 27 percent in Alexandria. Robberies fell 27 percent in Washington, D.C. and 77 percent in Alexandria. Aggravated assaults fell 39 percent in Washington, D.C. and 38 percent in Alexandria. Burglaries fell 64 percent in Washington, D.C. and 62 percent in Alexandria. Larcenies fell 30 percent in Washington, D.C. and 34 percent in Alexandria. Finally, motor vehicle thefts fell 11 percent in Washington, D.C. and 44 percent in Alexandria. Recall that motor vehicle theft is the only crime category with a statistically significant coefficient. Although the change was less negative for motor vehicle thefts compared to some other variables, we can attribute this 11 percent drop to the implementation of the Legacy Plan, which we are unable to do with the other variables.

Finally, rape and motor vehicle theft were graphed, which are shown in Figures 1 and 2 below. These were created to test the parallel trends assumption. These variables were selected for two reasons. First, the raw numbers for each type of crime were very different. Rapes are far less numerous than motor vehicle thefts, so differences in raw numbers could be inspected. Second, it allowed both significant and not significant variables to be inspected, with motor vehicle thefts representing the significant variable and rape representing the not significant variables. Both variables did indicate parallel trends over the time period.

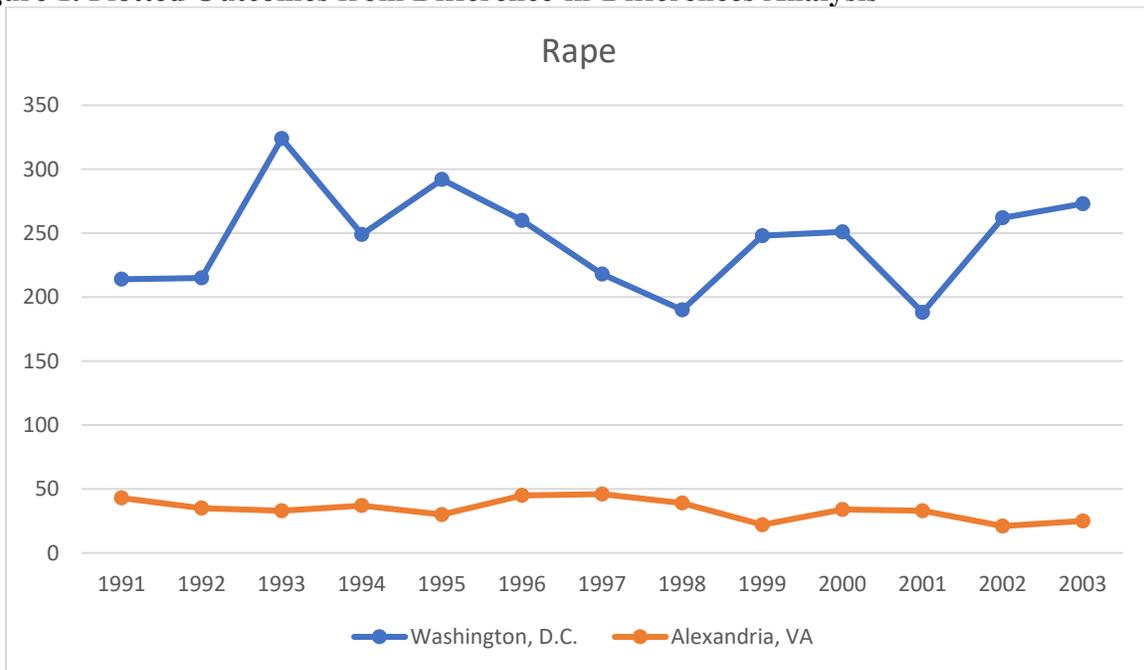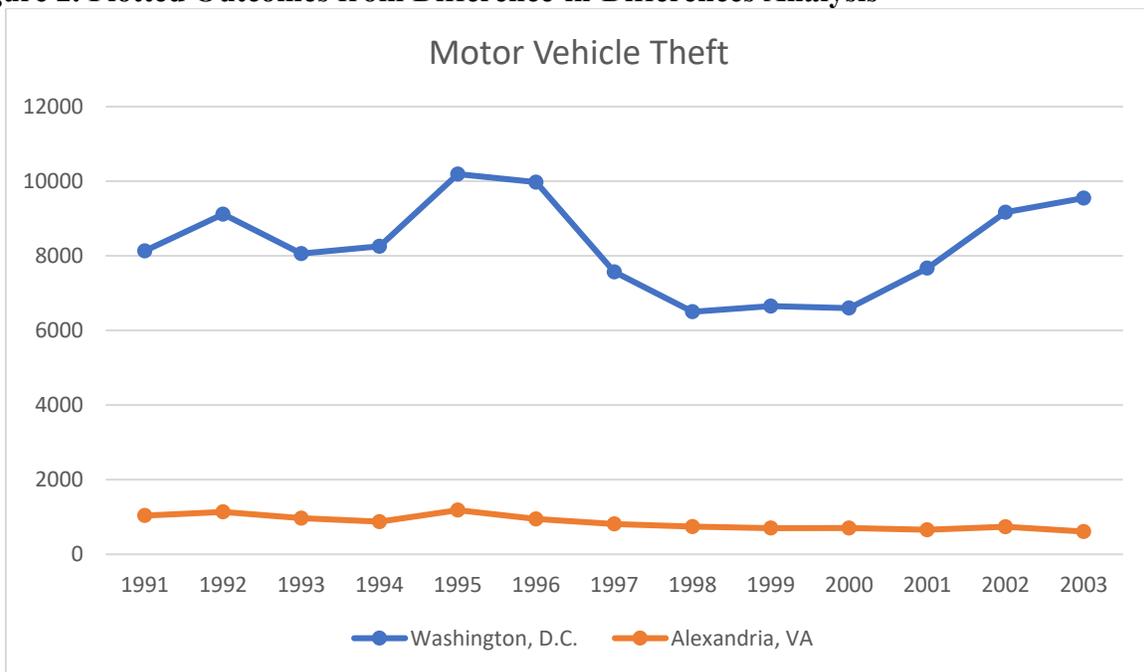**Figure 1. Plotted Outcomes from Difference-in-Differences Analysis**

Rape

Figure 2. Plotted Outcomes from Difference-in-Differences Analysis

Motor Vehicle Theft

V. Conclusions, Implications, and Recommendations

A. Conclusions

The number of crimes in both Washington, D.C. and Alexandria fell between 1991 and 2003. After 1997, the year Washington D.C.'s Legacy Plan was adopted, a large reduction in crime occurred with nearly 24,000 fewer reports in 2003 than in 1991. This trend held true for both crimes against persons (murder & non-negligent manslaughter, rape, robbery, and aggravated assault) and crimes against property (burglary, larceny, and motor vehicle theft) based on each index.

The difference-in-differences analysis, shown in Table 7, demonstrated the impact that the Legacy Plan had on Washington, D.C.'s crime numbers broken into seven types of crime. The analysis suggests that the Legacy Plan affected Washington, D.C.'s motor vehicle theft crimes to a statistically significant degree. Here, the coefficient was 0.33 and the p-value was .004. This means that, compared to Alexandria's change before and after 1997, Washington, D.C.'s change in motor vehicle thefts was 33 percent greater and this difference is significant because the p-value is less than 0.05. After the implementation of the Legacy Plan, Washington D.C.'s number of motor vehicle thefts per year fell 11 percent.

The analysis did not generate any other statistically significant findings. The coefficient for murder and non-negligent homicide was 0.04. The coefficients for the following crimes were: rape at 0.21; robbery at 0.21; aggravated assault at -0.01; and larceny at 0.04. In each of these cases, the p-value for the variable was above 0.05, making the change insignificant.

Although only one variable was statistically significant, all types of crime decreased after the treatment for both jurisdictions and this is worthy to note. Murder decreased by 46 percent in Washington, D.C. and by 50 percent in Alexandria. Rapes decreased by six percent in Washington, D.C. and by 27 percent in Alexandria. Robberies decreased by 27 percent in Washington, D.C. and by 77 percent in Alexandria. Aggravated assaults decreased by 39 percent in Washington, D.C. and by 38 percent in Alexandria. Burglaries decreased by 64 percent in Washington, D.C. and by 62 percent in Alexandria. Larceny decreased by 30 percent in Washington, D.C. and by 34 percent in Alexandria.

B. Implications

The most obvious implication is that city planning probably does not have an effect on crime rates. In the present study, the Legacy Plan adopted by Washington, D.C. affected motor vehicle thefts to a statistically significant degree, but that was only one variable out of many. Additionally, the raw number of overall crimes fell in the post-treatment time period. Although tempting to say the city plans reduced crime, it would be unwise to do so because only one variable was statistically significant. It is likely other factors not studied here were causing the reductions in crime. While further research may be required to determine the level of impact city planning had on crime compared to other factors, it is safe to assume there is some effect on crime, although probably only a small one. Here, motor vehicle thefts dropped at a statistically significant degree which we can attribute to the Legacy Plan.

These findings are consistent with prior research shown to accurately portray how beautification efforts affect crime. We know from literature studying Broken Windows Theory that crime is not necessarily affected by the physical layout of a city or the overall cleanliness and

levels of deterioration of a city.[74] Through cleaning up and upgrading many aspects of Washington, D.C., city officials may have played a small role in the reduction in crime that occurred after its implementation. However, given only one variable is significant, it is more likely the Plan played only a small role in the reduction. Much of the Legacy Plan involved re-creating the downtown and tourist areas in Washington, D.C. Although the specific details of what this would entail were absent, it likely included improvements such as new parking areas, improved lighting and security features, extra lighting on sidewalks and near public transportation areas, such as bus stops and subway entrances. These types of changes potentially help reduce crimes against property, which includes motor vehicle theft. Although we cannot be certain about any specific changes from the list above made by Washington, D.C., they certainly performed at least some of them, which likely influenced the reduction of crimes against property. Things like bright lighting in parking lots and garages and additional streetlights near where cars often park will likely help reduce crimes against motor vehicles.

In addition to significantly reducing motor vehicle thefts, the raw number of crimes went down in Washington, D.C. There was a steady decline in crimes reported across the entire period from 1991 to 2003. Although there was a large drop between 1996 and 1997, the year the Legacy Plan was approved, we cannot attribute that to the plan itself. Similar trends exist for overall crimes against people and crimes against property as well. Each type of crime generally declined across the entire period, with a large drop between 1996 and 1997.

There are practical implications as well. City planners and committees can glean valuable information from this study and others like it. First, city planning committees should be aware of the impact they could potentially have on crime rates in their cities. Their choices during the planning process, especially when explicitly considering potential effects on crime, target public safety as much as beautification per se. Depending on their allocation of resources, the objectives and goals they set, and the physical designs and upgrades being completed, crime could increase or decrease. Second, city planning committees should spend time researching plans crafted by other cities and the criminogenic impacts those plans had on its citizens. By studying models like the Legacy Plan that have proven to reduce certain types of crime and identifying the specific features of these plans that accomplished that reduction, they are better suited to make their own plan effective at combating crime. They should also identify types of crime that have not been significantly reduced in other city plans and brainstorm ways to address these gaps in their own plans.

C. Policy Considerations

One question policy makers should discuss amongst themselves when crafting policy is this: is crime rational? If so, this is an important consideration to make when discussing what constitutes a crime and what types of punishment are appropriate to be included in statutes. If crime is in fact rational, then it seems like criminals are intentional in their choices. They carefully and rationally think through their plan: the target, the best time to commit the crime, the likelihood of being seen, how much evidence they are likely to leave behind that will determine whether or not they are ever prosecuted, and the many other considerations that are made in order to complete a crime. If crime is rational, then policy makers may consider a more retributivist paradigm in crafting statutes. Harsher punishments are appropriate to deter potential criminals from committing

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[74] Taylor, *supra* note 3.

crimes and prison is more appropriate than other potential resolutions to cases. Because crime is rational, the best way to reduce crime is to make punishments harsh enough to outweigh any potential benefits a criminal would have for committing a crime.

On the other hand, if crime is not rational and criminals are driven by other motivations besides a simple question of how likely they are to be captured, these considerations become much more complicated. If crime is not rational, it could be caused by any number of other factors, by themselves or possibly convergently: to fulfill personal needs, because of mental health problems, outside influences pressuring a potential criminal, or simply boredom. If crime is not rational, it becomes important to identify the other causes of crime and develop strategies and plans for combating crime. For instance, this could involve investing more money into mental health treatment centers to help citizens struggling with mental health issues to receive help and interventions before they can become criminals. In areas of cities with lots of thefts, the government investing in community centers, food pantries, and clothing centers could help reduce crimes committed with the intention of providing for basic needs. After school programs and community organizations like the YMCA can keep children and teenagers engaged in the afternoons. This would ensure they are not falling behind in school and keep them away from the streets and young adults who might influence them negatively. Investing in any part of the community could be helpful in reducing crime.

One last policy consideration could simply be the value aesthetics bring to a community compared to investing in community members more directly. Although the results here may not be generalizable to the entire country, this is still likely a consideration most cities should make when designating a budget they believe will influence crime. Based on the results here, that money may be more effective in other areas besides aesthetic enhancements. Cities should consider their objectives when crafting new city plans and research the rationality of crimes. Doing so can help ensure budgets meet the goals they have, the needs of the community, and will hopefully include items that will certainly help reduce crime.

D. Recommendations

Although this study provided valuable information, there are ways to improve upon this methodology and build future studies upon the results discussed here. First, gathering more accurate data is a key step in completing studies such as this one. One problem with this study is the imputed data used for Alexandria. Two years required using computer programs to generate data rather than using real information. Correcting this error would provide a better picture of the effects city planning can have upon crime rates. Replicating this study with complete data gathered from a reputable source would create a stronger study with better conclusions. Additionally, data could be collected for a greater number of years. Arguably, one weakness of this study could be the relatively short time periods on both sides of the implementation of the treatment. Correcting this would simply mean collecting data for more years before and after 1997, the year the Legacy Plan was passed. This would help map trends and effects over a longer time period to better understand the long-term effects city planning can have on crime rates.

Similarly, this study should be replicated using other cities from different geographic regions or time periods. Additional studies would paint a clearer picture of the overall pattern of city planning and its effects. Conducting this study for other pairs of cities would help in establishing if the findings here can be repeated and if there are discrepancies in different geographic regions of the United States or other countries. Studying city planning across various

time periods can help us understand its history and its effectiveness, as philosophies of city planning have shifted over time. In addition, controlling for other factors would improve studies as well. Having knowledge about the level of policing, the goals of the developed city plans, and other factors that could affect the amount of crime would create stronger studies. Gathering data about these factors could help researchers eliminate them as potential causes of change and provide more accurate analyses of statistics that are generated.

Another interesting possibility would be to analyze the city plans themselves before selecting cities to use as treatment groups. This could accomplish several objectives. First, researchers could selectively choose certain types or qualities of city plans they would study. This could be beneficial in examining specific types of plans to determine if some are more effective at combating certain types of crime than others. It could also help scientists study the overall effectiveness of various types of plans, without considering comparisons to other types of plans. Further, document analysis of these plans would likely yield other research questions that would provide valuable information to the fields of criminology and city planning.

Finally, qualitative studies should be conducted to further investigate questions posed in this study and related questions. Exploring the lived experiences of people living in Washington, D.C. during this time period would provide a detailed account of the everyday lives of its citizens. Studies could shed light on the perceptions of Washington, D.C. citizens and the real effects they encountered before, during, and after the implementation of the Legacy Plan. Did Washington, D.C.'s citizens experience changes in their lives in response to the Legacy Plan? Did they experience changes in policing? Were their neighborhoods changed in positive or negative ways? What were the overall perceptions about their personal safety after the changes laid out in the Legacy Plan? Did they believe the plan was effective? Each of these questions and others not listed are important for fully understanding the questions posed in this study. Numbers only tell part of a story; the rest is told by the people who experienced the changes firsthand.

There are practical recommendations as well. As discussed earlier, city planners and city planning committees should consult models from other cities that have proven to reduce certain types of crime. They should adapt portions into their own city plans that would help with crime reduction. Cities may also benefit from researching the rationality of crime versus other motivations for committing crime, as previously discussed. Doing so could help city planning committees determine which items in their plan will be most effective in combating crime, if that is in fact their goal. Through this research, they can develop plans that will invest in areas of the community that will be most helpful for their goals. Additionally, they should evaluate their plans during implementation and over time. This will yield valuable information in the moment to make needed adjustments, as well as create a record of successes and failures that can be used by other cities and planners in the future. Lastly, cities should gather data on crimes and report them annually to appropriate organizations. The benefits to this are twofold: (1) it will allow the city to see the effects of its planning immediately and track the effects over time, and (2) it will allow researchers to have a complete picture of crime in the city. Social scientists rely on the availability of high-quality data to conduct studies and answer questions. When cities fail to submit data, this process is much more challenging.