2013

Firearm Lethality In Drug Market Contexts

James McCutcheon
University of Central Florida

FIREARM LETHALITY IN DRUG MARKET CONTEXTS

by

JAMES CHANDLER MCCUTCHEON
B.A. Auburn University 2008
M.A. Auburn University 2010

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Department of Sociology
in College of Sciences
at the University of Central Florida
Orlando, FL

Summer Term
2013

Major Professor: Jay Corzine

ABSTRACT

The current study examines firearms' impact on the relationship between illegal drug markets and homicide. At the county-level, Iowa and Virginia are analyzed using crime data from the National Incident Based Reporting System. More specifically, gun availability is tested as a mediator for county drug crime rates and homicide counts. Variable selection and prediction is based on routine activity and social disorganization theories. I argue that social disorganization allows the context for which criminal opportunity presents itself through routine activities. I posit gun availability mediates a positive relationship between illegal drug markets and homicide, with differences between urban and rural communities.

I dedicate this writing to the victims who fall into the scope of this analysis. This study represents more than numbers in a table; they are mothers, fathers, daughters, and sons.

ACKNOWLEDGMENTS

I would like to thank my family, Sue Chandler McCutcheon and James Arthur McCutcheon who asked me to go to college for at least one year. They are the reason I started this journey. Additionally, I would like to thank my spouse, Ashley Wilson McCutcheon, who made me continue to this journey. I will never forget the sacrifices you have made for me and I will be doing my best for the rest of our lives paying that debt. I would like to thank all of my mentors at Auburn University, Greg Weaver, Greg Kowalski, Raj Mohan, Angela, Ware, Janice Clifford, Mitchell Brown, Charles Faupel and at the University of Central Florida Jay Corzine, Lin Huff-Corzine, Jana Jasinski, Jason Ford, Shannon Carter, Scott Carter, Fernando Rivera, Liz Grauerholz, Ida Cook, Jim Wright, Heili Pals, David Gay, John Lynxwiler, and Elizabeth Mustaine. Each one has contributed there humor, time, advice, and knowledge to me and for that I am eternally grateful. Lastly, I want to extend extra appreciation to my committee. To John Jarvis, your compassion and drive in this field is unparalleled as you continue to bridge practice and research to create new efforts and policy that saves lives. To Jana Jasinski, I want to thank you for keeping your door open and dropping your work, however important, to help and offer advice to those who need your assistance. To Lin Huff-Corzine, your understanding and empathy for others is not just a gift you have, it is who you are as a person, and I want to thank you for that as it has helped me more than you know. Lastly, to Jay Corzine, there are no words or phrases that could justly explain all you have done for me. You are my mentor. I will for the rest of my life be paying forward the knowledge, support, and guidance you have invested in me. I could not have asked for a better person to guide me through this process.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS OR ABBREVIATIONS

ATF	Alcohol Tobacco and Firearm
CDC	Center for Disease Control
FBI	Federal Bureau of Investigation
HIDTA	High Intensity Drug Trafficking Areas
LOWESS	Locally Weighted Regression
NBR	Negative Binomial Regression
NIBRS	National Incident Based Reporting System
NIJ	National Institute of Justice
OLS	Ordinary Least Squares
UCR	Uniform Crime Reports
U.S.	United States of America

CHAPTER ONE: INTRODUCTION

In 1995, Blumstein was the first to theorize about the relationship between drug markets, access to firearms, and homicide, although other researchers have examined these concepts independently. Such studies have demonstrated that *systemic violence* is a product of illegal drug markets (Goldstein, 1985; Resignato, 2000; Reuter, 2009; Corsaro, Hunt, Hipple & McGarrell, 2012). Moreover, spatial locations where illegal drug markets operate carry with them various pathways to increased violence. The illegal nature of drug markets are what in fact makes them more violent. All negotiations or disagreements where illegal drugs are the focus cannot be settled in courts. Since this is the case, these disputes must be handled out of the view of the justice system and in an informal manner. Resolutions may vary, but regardless do in fact increase the chance of violence during the course of the disagreement.

Much like systemic violence, there has been much research on firearms and their relation with violent crime and lethality (Cook, 1981; Killias, 1993; Felson & Messner, 1996; Hoskin, 2001). The research is consistent regardless of level; nationally, the countries with the most firearms hold the highest homicide rates. Individually, if there is a firearm present in the household there is a higher chance of a lethal event occurring (Hemenway & Miller, 2000; Spano, Frelich & Bolland, 2008).

Blumstein suggests that illegal drug markets, where *systemic violence* is prevalent, create a context where dealers see themselves as suitable targets and thus arm themselves for self-protection. He goes on to suggest that this creates an ‘escalation effect’ where community members not involved with the illegal drug market will begin to notice drug dealers who are

armed in their neighborhood and make the decision to purchase a firearm for self-protection themselves. Such an arms race in the community increases the opportunity for lethal events to occur. Understanding the link between these variables is more important in light of recent events and statistics. It is also essential to have a firm understanding of the role drugs and firearms have in U.S. culture.

As the great equalizer (Cook, 1981), guns have been a staple of North American culture from the beginning. In the recorded history of the world, the United States has only been present for a limited duration of time. As the frontier was settled firearms were relied on to hunt and to guard one's family and possessions. This lifestyle has been glamorized in modern media—so have guns (Wright, Rossi & Daly, 1983). While touting the Second Amendment, groups such as the National Rifle Association and Gun Owners of America continue the fight for gun rights, spending nearly 30 million dollars from 1997 to 2003 lobbying for their cause (Center for Responsive Politics, 2012). Organizations such as the Coalition to Stop Gun Violence and the Brady Campaign to Prevent Gun Violence stand for the cause of gun control, yet spent approximately 2.4 million during the same years (Center for Responsive Politics, 2012). Debates between the two groups, pro-gun and anti-gun advocates, include skirmishes over policies affecting availability and expediency of ownership. But make no mistake, regardless of these debates—guns are here to stay.

Firearm Statistics

The number of firearms in the United States (U.S.) remains elusive. By 1982, there were estimated to be 120 million guns in the U.S. (Wright et al., 1982). In 1995, the United States Department of Justice estimated the number of firearms in the U.S. to be 223 million. As of 2007, it was reported that out of the 875 million known firearms in the world, the U.S. owns 270 million of them (Reuters, 2007). These facts are not surprising considering that for every one minute that passes 10 guns are manufactured in the U.S. (ATF, 2011). In addition, there are signs that illegal guns are prevalent in the U.S. In 2009, the ATF prosecuted 18,406 cases on firearms trafficking and illegal possession (ATF, 2009). Further, a recent Gallup (2011) poll found that 47% of American households own at least one gun. Additionally, there are a total of nine firearms for every ten people (Reuters, 2007).

As previous research has shown, firearms add to the lethality of violent events. The National Institute of Justice (NIJ) reported that 68% of all homicides were committed with firearms. In 2009, the Center for Disease Control (CDC) reported there were 16,799 homicides in the United States, and 11,493 of those deaths were firearm homicides (CDC, 2012). Non-fatal gun crime has decreased from 1.3 million in 1994 to 352,810 in 2009 (NIJ, 2009). In terms of policy initiatives the Brady Handgun Violence Prevention Act (1993) established a waiting period and background checks for firearm purchasers in an attempt to decrease gun violence. Intervention and community programs focus their attention on urban areas as they work to counter gun violence (Davidson, Durkin, Kuhn, O'Connor, Barlow & Heagarty, 1994; Braga, Kennedy, Waring & Piehl, 2001; Hardy, 2002).

Illegal Drug Statistics

Much like guns, drugs are a significant factor in helping to shape U.S. law and culture. Drugs such as tobacco, alcohol, cannabis, and opium have a long history in the U.S., although some endeavors have been more profitable than others. In the last century many drugs, including heroin, marijuana, and LSD, have been deemed to be criminal substances by states and the federal government. It is important to understand that regardless of their illegality, a consumer demand for psychoactive drugs still exists. A sufficient number of consumers will bring an opportunity for profit. Illegal and thus underground markets exist to cash in on this demand. Much like legal businesses, illegal drug markets involve a place for production, a network for transportation, a place for storage, and a location to sell and distribute the drugs to consumers.

In 2007, it was estimated that 1,841,200 arrests occurred for drug violations (NIJ, 2012). Between 1987 and 2007 the percent of arrestees for drug-related offenses increased from 7.4 to 13 percent. Drug possession makes up most drug arrests at 82.5%, while drug sales and manufacturing represent 17.5% of all drug-related arrests. There were more arrests for heroin sales and manufacturing (45%) than for any other drug. There were more marijuana arrests for possession (51%) than for any other drug (NIJ, 2012).

Additionally, drugs and lethal violence are closely associated (Goldstein, 1985). In 2004, NIJ found that 18% of federal inmates who perpetrated violent offenses did so to obtain money to buy drugs. In 2007 four percent of 14, 831 homicides in the U.S were drug-related offenses (NIJ, 2012). Although the connection between drugs and homicide is well documented there may be other variables that mediate the relationship (Blumstein, 1995).

Guns, Drugs, and Environment

The violent nature of areas with high volumes of illegal drug sales has been well documented (Corsaro et al., 2012; Goldstein, 1985). Guns might act as a catalyst for illegal drug market environments to become more lethal (Blumstein, 1995). Using routine activities theory (Cohen & Felson, 1979) and social disorganization theory (Shaw & McKay., 1942), the current study examines the impact of gun availability on the association between illegal drug markets and homicide in rural and urban counties in Virginia and Iowa. Social disorganization posits that there is a context that provides increased opportunity for crime to occur; loose or nonexistent social networks lead to decreased social control that may provide a more viable context for crime. Similarly, routine activities theory suggests that criminal incidents are not random occurrences. Three components are needed in some degree for a criminal opportunity to occur: a motivated offender, a suitable target, and the lack of a capable guardian.

Illegal drug markets create a socially disorganized context for surrounding areas (Martinez, Rosenfeld & Mares, 2008) that brings forth much criminal opportunity for offenders (Bernasco & Block, 2009). Suitable targets who bring money to such areas for the purchase of illicit drugs present a good opportunity for offenders. Additionally, those dealers who are holding the cash make for somewhat suitable targets for victimization. It also has been shown that guardianship through law enforcement is often not effective of reducing crimes in these areas and in some cases increases the violence, as dismantling illegal drug networks may end in deadly altercations (Resignato, 2000). The increased availability of guns could escalate offender opportunities and, therefore, increase lethality. Furthermore, capable guardianship may be

neutralized if gun ownership is at high levels in the community, because widespread gun availability levels the playing field between offenders and guardians. Scholars have demonstrated that the presence of guns can increase the odds that a lethal event will occur 40 fold (Felson & Messner, 1996). Here it is posited that the lethality of drug market related crime is positively related to gun availability.

The focus of the current study is the area around the point of sale. I capture the concept of illegal drug markets through county-level drug crime. As will be discussed in Chapter 3, an illegal drug market may not simply impact one street corner; instead, the presence of an illegal drug market can impact the entire community (Corsaro et al., 2012). First and specifically, I address the question whether drug markets increase homicide counts at the county-level in Virginia and Iowa when controlling for theoretically relevant socioeconomic and demographic variables (e.g., racial heterogeneity, concentrated disadvantage)? I hypothesize that illegal drug markets have a positive relationship with homicide counts in both Virginia and Iowa. Secondly, is the relationship between drug markets and homicide impacted by gun availability? I posit that the positive relationship between drug markets and homicide counts is fully mediated by gun availability at the county-level. Third, are there urban and rural differences in this relationship? Briefly stated, the lethality of drug markets is affected by the gun availability in the county, but is the impact stronger for urban counties than for rural ones? I hypothesize these relationships exist within the counties of both states. In the analyses Virginia and Iowa counties are pooled for the initial analysis; in following stages of the analysis counties within the two states are analyzed separately.

This research fills an important gap as there has yet to be a study to examine urban and rural differences utilizing the variables of gun availability, illicit drug markets, and homicide. The current study is essential to an understanding of where, firearms may be more lethal. As suggested earlier, context matters, especially in the case of firearms. The geographical area may very well change the meaning and impact of guns. This research goes further to uncover if gun availability matters less in illegal drug markets in rural counties than similar locations in urban centers, when it comes to lethal violence.

Specifically, the current study explores whether the existence of firearms impacts the relationship between drug markets and homicide for rural and urban locations. Here, it is hypothesized that lethality is affected by firearms in drug market areas. The current chapter covered broad but relevant statistics concerning drugs, guns, and homicide. It also discussed how routine activities and social disorganization theories may provide a foundation for variable selection and prediction. Chapter 2 will cover the theoretical paradigms for this study. This includes a discussion of routine activities and social disorganization theories and how these theories may be synthesized to provide a framework for this study. In Chapter 3, I review illegal drug market research; specifically in relation to the association with violent crime. Additionally, I explore what might affect the lethality of a violent crime. Guns' association with violence, as well as measurement issues, are explored in this review. I examine literature that studies all three key variables (drug markets, gun availability, and homicide) to provide a foundation for the current study. Here I discuss both contributions and flaws with previous research and how my research will advance our knowledge of this area. In Chapter 4, the data sources and methods used in this analysis are discussed. In this chapter I explain the choices of the units of analysis, as

well as the measurements used, and the analytical strategy that will be used to examine the data. Chapter 5 includes both preliminary and final analyses. This chapter is divided into three sections, (1) analysis of the combination of both states, (2) analysis of Iowa individually, and (3) analysis of Virginia data. Each section begins with a preliminary analysis of descriptive statistics and necessary data transformations. Lastly, Chapter 6 discusses the findings and the conclusions. Theoretical and policy implications are discussed, as well as limitations and future directions for research.

CHAPTER TWO: THEORY

Routine Activities and Social Disorganization Theory

Crime is not a random occurrence. The intersection of offender, victim and law lays the path for the social definition of a crime violation. The social structural and spatial nature of crime leads this discussion to two prominent theories in criminology: social disorganization and routine activities. Classically, social disorganization connects increased crime with a neighborhood's low income, residential instability, and ethnic heterogeneity (Shaw & McKay, 1942). For routine activities theory, much as in social disorganization, location matters as motivated offenders, suitable targets, and an absence of a capable guardian must intersect in space and time for crime to occur (Cohen & Felson, 1979).

Social Disorganization

A thorough description of social disorganization (Shaw & McKay, 1942) and routine activities theory (Cohen & Felson, 1979) is called for, due to its relevancy in the current study. As the first macro-level sociological theory of crime to be developed in the United States, social disorganization is focused on socio-structural spatial characteristics as explanations of crime. Social disorganization can be traced back to varying sources, notably the work Mabel Elliott, but currently in the field Shaw and McKay (1942) are given credit for its first use in a major empirical study of crime. The founders of social disorganization theory, Applying social disorganization to rates of male delinquency in Chicago, Shaw and McKay (1942) argue for environmental factors as contributors to crime as they find social deprivation positively

correlated with crime. Additionally, they find that neighborhood population stability and homogeneity are strong negative correlates of delinquency.

Using data from the Cook County Juvenile Court in Chicago, Shaw and McKay determined that many of the delinquents were from the same neighborhoods. Although the ethnic groups shifted in time it was the same neighborhoods or environments that continued to harbor the majority of the criminal delinquents. Shaw and McKay demonstrated through mapping that zones with the highest poverty and population turnover, *transition zones*, were home to the most delinquents (Shaw & McKay, 1942).

As the movement of the population through these zones continued, crime and urban decay increased as community stability became an afterthought. They found that delinquency decreased for each additional mile away from the city center. The redistribution of the population through these zones led to the disorganization of social networks within the community. A wide variety of ethnic groups, cultural traditions, and norms flooded new communities, leading to loose informal community networks. The weak social bonds facilitated a socially disorganized neighborhood as delinquent values were fostered and crime became the eventual product (Shaw & McKay, 1942).

Social disorganization has been reinforced and extended through the works of various scholars. Kasarda and Janowitz (1974) discuss in greater depth how increased population fluidity compounds social disorganization of community members as residents are eyeing other neighborhoods (Kornhauser, 1978). Here it is argued that social disorganization does not imply chaos, but instead a lack of social ties. As the *systemic model* suggests, kinship networks,

socialization processes, and family ties are all necessary components of a community (Bursik & Grasmick, 1993; Kasarda & Janowitz, 1974). Residential duration is the key factor that impacts social behavior toward the neighborhood or community. Strong networks of association are prevented by increased social mobility in and out of the area (Bursik & Grasmick., 1993; Kasarda & Janowitz, 1974). Bursik breaks down this component of social disorganization, listing three assumptions: (1) when there is a lack of interest of community members due to their expected flight from the area, internal control is difficult to develop; (2) when the community is in an unending state of change, the networks that maintain informal social control are neither established nor maintained; and (3) goals cannot be attained and problems will not be solved due to miscommunication (Bursik, 1988; Shaw & McKay,1942).

Social disorganization theory grew through studies that focused on economic, demographic, and social structural patterns in geographical areas. These studies provided new measures such as urbanization and family disruption patterns to capture the theoretical concept of social disorganization. Such measures assisted in the understanding of social disorganization and how it can be operationalized (Linsky & Straus, 1986; Sampson & Groves, 1989).

The expansion of the social disorganization framework continued as new scholars began to pick up the torch. In 1989, Sampson and Groves defined social disorganization "as the inability of a community to realize the common values of its residents and maintain effective social controls" (p. 96). Social factors lead to increases or decreases in social capital. The concept of *collective efficacy* has been defined as a neighborhood's ability or inability to establish and keep order throughout the area (Sampson, Raudenbush, & Earls, 1997). This refers

to the power of a group such as a neighborhood to maintain or influence public order. Neighborhoods with decreased collective efficacy may provide less social control. Sampson, Raudenbush and Earls (1997) found that neighborhoods with high collective efficacy have lower crime rates overall. One way to measure the concept of collective efficacy is through surveying neighborhood residents' involvement in public affairs at the community level (Morenoff, Sampson & Raudenbush, 2001; Sampson et al., 1997). Typical contemporary measures of social disorganization include: concentrated poverty, dilapidated buildings, family disruption, and decreased home ownership, among others (Sampson et al., 1997).

More recently, scholars have examined violent crime and drug market behavior in relation to social disorganization. Martinez, Rosenfeld and Mares (2008) concluded that drug activity measures had a significant impact on violent crime independent of social disorganization predictors. This finding showed that although social disorganization has an impact on these offenses, drug market activity stands on its own as a predictor of violent crime. The current study intends to further test the impact that social disorganization has on illegal drug markets. Contrary to Martinez, Rosenfeld and Mares' (2008) findings, here it is theorized that a context that is socially disorganized contributes to illegal drug market prevalence, thus providing for increased opportunity for homicides to be committed.

Routine Activities Theory

Developed by Cohen and Felson (1979), there have been several applications and extensions to routine activity theory. This theoretical perspective is arguably the first to identify the elements that must exist for a crime to occur. These include the presence of a suitable target,

a motivated offender, and the lack of a capable guardian. Consistent with social disorganization theory, Cohen and Felson suggest that criminal acts of violence or victimization are not randomly distributed in a society.

Cohen and Felson (1979) argue that many theories of crime "have difficulty accounting for the annual changes in crime rate trends" (p. 604). They argue that causal variables embedded in theoretical structures do not maintain their consistency longitudinally or cross-culturally. Instead these theorists posit that routine activities vary by culture. For them, routine activities are "recurrent and prevalent activities which provide for basic population and individual needs" (Cohen & Felson, 1979, p. 593). In their viewpoint a focus on routine activities will reconcile many of the inconsistent findings in the criminological literature.

Described as being related to rational choice theory (Beavon, Brantingham & Brantingham, 1994; Smith, Frazee & Davison, 2000), routine activities theory has become one of the more significant theories in criminology. Before studies that extend the theoretical frame of routine activities are discussed, canons of this theoretical doctrine must be unveiled. As mentioned above in brevity, crime is not a random event. There is an elemental property within criminal action. Cohen and Felson (1979) suggest that criminal acts are associated with lifestyle, demographics, and daily routines. Essential in understanding victimization risks are social contexts and locations (Sherman, Gartin & Buerger, 1989; Mustaine & Tewksbury, 1997; Spano et al., 2008).

Cohen and Felson, (1979) argue that there must be a convergence of three elements spatially and temporally for crime to take place. The opportunity to commit a crime is based on

lack of capable guardianship, target suitability, and offender motivation (Cohen & Felson, 1979). The target's suitability to a motivated offender may be based on various factors such as vulnerability or the value of the item of interest; however, the entrance of additional factors, such as capable guardianship, can alter the suitability of the target (Spelman, 1993). The premise though is that the offender is reasoning, which denotes a level of rationality in choosing the victim (Cornish & Clarke, 1986). Thus, it is implied that criminal perpetrators are rational. In short, the variation of the routine activities of one's lifestyle either increases or decreases their chance of victimization.

As the exploration and extension of routine activities theory moves forward new questions emerge. The theory posits that certain groups tend to be victimized more than others. Theorists have suggested that this could be due to daily routines that increase the likelihood of victimization. An additional explanation could be that the individuals who are targeted more often are more suitable or easier to victimize due to their daily routines (Schwartz & Pitts, 1995; Mustaine & Tewksbury, 1997; Berg & Loeber, 2011; Light & Harris, 2012).

Demographics play a significant role in routine activities theory. Age, sex, and race are among the key predictors for victimization. The findings for these predictors are so consistent that a critique of the contemporary application of routine activities theory is that different categories within demographic variables should be analyzed separately (Mustaine & Tewksbury, 1997). For example, women experience different levels of victimization as they are "less free than men in their movements in society" (Mustaine & Tewksbury, 1997, p. 183). These different experiences come from women who surround themselves with men who can play the role of both

the capable guardian and the motivated offender concurrently (Schwartz & Pitts, 1995). Various studies have found demographic correlates that put certain groups in a more likely position to be victims of an offense (e.g., Mustaine & Tewksbury, 1997; Berg, 2011; Light et al., 2012). These studies find that men, African Americans, and those of low socio-economic status are the most likely to be victimized. Locations, such as disorganized communities or neighborhoods, may hold routines that increase the likelihood of victimization. Within the framework of the current study, illegal drug markets might provide one context within socially disorganized neighborhoods that facilitates opportunities for violent victimization. In addition, this relationship might be impacted based on the urbanity of the county.

The theoretical framework of routine activities would supply varying explanations for the relationship between drug markets and socially disorganized neighborhoods. For instance, are those with low economic standing in the community more likely to be victims of violence due to their lifestyle patterns or because they make an easier target? A recent study has examined violent victimizations of undocumented workers (Bucher, Manasse & Tarasawa, 2010). The findings were consistent with the components of routine activities theory. Undocumented workers are much less likely to report crimes and typically carry all of their money on their person, thus they make extremely suitable targets. Additionally, they do not have the same access to capable guardianship as legal citizens due to their lack of legal documentation (Bucher et al., 2010).

Location is another key element that is essential in routine activities theory. Offenders have a greater chance to commit offenses in locations that they frequent, whether they are at

home, work, or somewhere in between (Holmes & Holmes, 1996). Proximity to an area where offenders are more plentiful increases victimization risks. An example of this is young women who are in locations where their likelihood of sexual victimization increases. These locations include some college parties, bars, and other similar situational contexts. Such locations are in close proximity to potential offenders (Clodfelter, Turner, Hartman & Kuhns, 2008).

Synthesis of Theories

Cloward (1959) was the first to argue for the integration of social disorganization and theories of opportunity. The argument for integration made by Cloward is not too dissimilar from what we see in today's discussion of integration (Weisburd, 2012). The study of macrosocial crime locations (and their contextual structure) has been largely associated with microsocial opportunity theories such as routine activity theory (Bursik, 1988; Simcha-Fagan & Schwartz, 1986). The study of crime and place or opportunity and context is the summation of what is gained through the process of "theoretical integration" of social disorganization and routine activity theory (Bernard & Snipes, 1996).

A sweeping argument made by various theorists (e.g., Sampson & Wooldredge, 1987; Roundtree, Land & Miethe, 1994) is that the crime causing components of the variables utilized through routine activities theory are linked to social structural contexts. Once again, spatial location such as illegal drug market areas matter in uncovering how the proximity to motivated offenders affects the likelihood that a crime will be committed. These concepts connect structural contexts to opportunity. Moreover, the knowledge of how an offender's predisposition

interrelates with contextual cues that affect the decision to commit crime is a benefit of the synthesis of these theoretical frameworks (Smith et al., 2000; Rice & Smith, 2002).

The background behind synthesis may come in a multilevel analysis approach. One of the connections between both of these theories is that the risk of victimization is based on exogenous social variables. This most certainly is a theoretical premise of social disorganization. Contextual features of the neighborhood may add to victimization risks based on the organization of the community. The same can be said for routine activities theory, although at the individual-level, factors such as capability, suitability, and motivation can be based on outside features.

Much like the current study, several investigations have tested the advantage of integrating these two theories. Such studies have utilized measures that represent both social disorganization and routine activity at the same time (Sampson et al., 1987; Kennedy & Forde, 1990; Miethe & McDowall, 1993; Rice et al., 2002). For synthesis to be possible there must be common characteristics and some level of overlap between the theories. For instance, individual victimization risks (target suitability) may be represented through measures of poverty or heterogeneity of the community to capture both theoretical paradigms. This approach involves utilizing one measure to account for both social disorganization and routine activities theory. There is not much doubt theoretically that opportunity is based on context. Criminal opportunities will persist in zones or locations that provide favorable contexts (drug markets) for such criminal behaviors (lethal victimizations).

The concept of *social control* may provide another gateway to synthesis. The elemental tripartite of concepts make up the backbone of routine activities theory and offers a form of

social control. Capable guardianship is the existent component of routine activities that supplies a social control mechanism. Similarly, this element is a core component in the paradigm of social disorganization. Social control is maintained by healthy social networks that guard the community or neighborhood (Rice et al., 2002; Roundtree et al., 1994; Sampson et al., 1987).

Proponents of both theories posit that the factor of social control, whether it is through social networks or capable guardianship, decreases the likelihood a criminal offense will take place. The theoretical concepts may share similar roots, but the level at which they are applied reaffirms the differences that lie within. The technique of using various overlapping measures to capture both concepts to synthesize both theories has been previously implemented by a few studies (Miethe et al., 1993; Smith et al., 2000; Rice et al., 2002). Social disorganization is predominately tested on a community level, whereas small units of social control are networked and embedded within larger neighborhood measures (Miethe et al., 1993; Rice et al., 2002).

The motivated offender is another concept of routine activities that provides an area of overlap with social disorganization. Within the framework of social disorganization the contextual climate exists for motivated offenders to flourish. Variables such as poverty, population turnover, and ethnic heterogeneity may work as catalysts for motivation. Social disorganization provides a favorable ecological environment for the manifestation of criminal motivation (Simcha-Fagan et al., 1986; Miethe et al., 1993; Roundtree et al., 1994; Rice et al., 2002).

Synthesis in the Current Study

Even though both social disorganization and routine activity theory stand on their own, one theory does not need the other to be viable. The synthesis of these two approaches, however, increases explanatory power in the context of the current study. Contexts and opportunity are both examined in this analysis. Ontologically, the concepts of routine activities overlap those of social disorganization. Socially disorganized neighborhoods are spatial locations where there is much opportunity for illegal networks with motivated offenders to thrive. In these contexts there may be breakdowns of social control and guardianship, thus providing the opportunity for illegal enterprises such as drug markets to be established. The explanatory power increases with the synthesis of these theories. Without the inclusion of social disorganization, understanding the broader context in which illegal markets operate is lost. Specifically, the success of illegal networks such as drug markets may depend on the lapse in crime preventing social networks. In relation, the non-inclusion of routine activities theory would limit the epistemological framework of the micro-level variance in socially disorganized contexts. Variance is explained through the variables utilized in this study, which have an impact on the potential relationship between drug markets and homicide. Locations have an impact on the number of potential offenders, targets, and guardians. I argue that gun availability adds a lethal element to these relations. A potential or motivated offender is more lethal with a firearm, capable guardians are less capable as increased gun availability has leveled the playing field, and targets are more likely to meet lethal ends (Cook, 1981). Importantly, what is being posited is that all of these players will exist and perpetrations will continue with or without firearms, but these contexts become more lethal with increased gun availability. More thoroughly, environmental factors impact the choices of

individuals and thus the opportunities for lethal violence. Motivation of offenders, target suitability, and capable guardianship may be founded through broader structural or contextual variables.

Again, opportunity to commit crime is based on three elements. This has been one of the main features of this discussion. A criminal event is based in situational events occurring at specific locations. Adding a situational contingency at a certain time and location may provide or remove opportunity for an offender to strike. For instance, access to firearms in the community may influence decisions related to violent outcomes, e.g., carrying a gun for protection, confronting an individual who is cheated on a drug deal, deciding not to retaliate for a perceived offense. It is not possible to analyze these possibilities with the current dataset.

To summarize, the current study synthesizes routine activity and social disorganization theories. I argue that this theoretical premise offers overlapping features. The current study utilizes measures that capture key components of both theories. Specifically, social disorganization and routine activities are tested together through the use of encompassing macro-level variables. Social disorganization proxy measures are applied to the county level in Iowa and Virginia.

The level of racial heterogeneity, residential mobility, and concentrated disadvantage are included to capture the organization of social networks. Additionally these same variables are utilized to capture part of the trio of routine activities. The level of communication and integration within the community is impacted by the measure of residential mobility and racial heterogeneity. Increased residential mobility and racial heterogeneity may also decrease social

control mechanisms that represent capable guardianship. Thus an increase in residential mobility and racial heterogeneity leads to a decrease in capable guardianship. Routine activities theory suggests poverty and other types of concentrated disadvantage are related to both target suitability and offender motivation. Importantly, it should be noted that the overlapping theoretical variables of social disorganization and routine activities theory inform the current study. As such this effort should not be viewed as a test of the synthesized theory; instead it should be understood as an investigation of theoretical factors.

CHAPTER THREE: LITERATURE REVIEW

From the previous section we now have a theoretical understanding of the characteristics of how a physical location could increase victimization risks. All locations exhibit some type of increased or decreased risks. One such area that could hold an increased risk for victimization is that surrounding an illegal drug market as its contextual features may increase homicide. Moreover, an increased number of firearms will increase lethality for such victimization. Additionally, the cultural surroundings of the environmental impact of illegal drug markets and gun availability could offer varying results. Specifically, rural and urban counties may be affected differently by these variables.

A sizable amount of scholarly research is focused on illegal drug markets, homicide, and gun availability (e.g. Blumstein, 1995; Werb, Rowell, Guyatt, Kerr, Montaner & Wood 2011). The literature that is present offers a firm understanding of these topics and is empirically rich. Yet, many scholars have not considered regional contexts in their analyses.[1] Additionally, articles on the relationship of these variables have been limited to controversial measures (Kleck, 2004) and trend analyses (Blumstein, 1995). The following discussion reviews the findings of previous research. In short, I examine research that has tested the impact of gun availability and drug markets on violent crime.

[1] Mainly, the rural and urban differences on the county-level have not yet been examined in studies utilizing both illegal drug market and gun availability variables.

Lethality

Homicide includes non-negligent manslaughter, justifiable murder, and murder. It is defined as the "willful (non-negligent) killing of one human being by another" (FBI, 2000). Successful lethal intent is implied in the definition. Although in several types of violent crime lethal intent might be present, but it is not necessarily achieved in the outcome. The reason this discussion is important is because a distinction needs to be made between homicide and other violent crime events. Since the focus of this study is homicide, the following discussion will focus on specific predictors that increase the lethality of violent crime.

The lethality of a violent crime can be based on various factors. A study by Doerner (1983) posits that lethality can be impacted by available medical resources in the area. He concludes that high homicide rates in the South are in part produced by the lower level of medical resources regionally. A later study by Doerner (1988) finds that, in addition to medical resources, the availability and timeliness of emergency transportation has an effect on the lethality of violent crime events. A more recent study is consistent with these results as analysis of national data from 1960-1999 suggests that the lethality of violence has decreased due to achievements in medical technology (Harris, Thomas, Fisher & Hirsch, 2002).

The constant of human agency is not excluded from factors leading to lethality. A study by Felson and Messner, (1996) examined the situational contexts of violent crimes. They posit that offenders will choose to kill so they avoid becoming future targets themselves. Retaliation and prosecution are believed to be avoided if the victim is dead. The researchers conclude that offenders are more likely to use lethal violence when no accomplices are present and their

identity is known by the victim. Those who used a gun were 40 times more likely to kill their victim. Additionally, African Americans and males were more likely to be victims of lethal violence (Felson & Messner, 1996). Felson and Steadman (1983) finds that those who are under the influence of drugs or alcohol are more likely to be victims of homicide. The following sections will more deeply explore lethality through the factors of illegal drug markets and gun availability.

Illegal Drug Markets and Homicide

What is most important to understand about illegal drug markets is that they are quite similar to legal markets and distribution networks. Defining illegal drug markets has been dealt with in various ways throughout the literature. An early illegal drug market analysis of Jersey City by Weisburd, Green, Gajewski, and Belucci (1992) employed three components to identify illegal drug markets. These three components included: arrest data for the selling of an illicit drug, community phone-ins where private citizens identified drug areas and surveys that asked respondents the location of illegal drug sales in the area. The evaluation of this specific area concluded that locations with visible drug sales were isolated in a few locations around the city.

Drug markets can be detailed as closed, open, mobile, and open-air (Harocopos & Hough, 2005). Different forms of drug markets are based on geography and how the transaction takes place. A closed market is one where there is a friendship or acquaintance network in place between the buyer(s) and seller(s). An open market is where one party does not know the other. In a mobile market a seller and buyer discuss specifics on where and when the exchange will

take place on the phone. Lastly, open-air markets are geographically defined areas that are open where transactions take place (Harocopos & Hough, 2005; Gaziarifoglu, 2011).

There have been subsequently varying measures of drug market areas. For example, Martinez and associates use overdose deaths to measure drug market activity (Martinez et al., 2008). Other studies such as Bright and Ritter (2010) utilize illegal drug price as a measure of drug market activity. The retail price of illicit drugs in the area provides an inference of the supply and demand structure and thus the quantity of drugs. On the other hand, many variables could impact the cost of drugs; for example fluctuations in the local economy are a component of retail pricing (Kadiyali, Chintagunta & Vilcassim, 2000).

The street-level drug market is not too dissimilar from many other legal markets found in society today. As Waterston (1993) puts forward:

> Among the more important marketing techniques are attractive packaging (stamps), name recognition (brand names), and consumer involvement and camaraderie around drug-consuming activities (product name contests). Moreover, product names…reflect strong, positive attributes and notions of success, strength, power, excitement, and wealth, encourage consumers to make symbolic connections with these products (p. 117).

It is clear there is much similarity between legal markets and illegal markets. As in any market, there is a network in which the goods are produced, then transported to markets where items are stored, and then the merchandise is sold. Areas with higher levels of consumer traffic are predisposed to having more points of sale and distribution.

An area of increased drug-related arrests may very well hold characteristics of a market for illicit drugs. In other words, if one county has a higher level of supply of a certain good, it is likely that the county is home to the distribution point of that good.

Illegal drug markets supply for buyers inside and outside of an area. These markets are much like other legal markets as they are profit seeking. But unlike legitimate markets there is no legal recourse for customers, employees, and retailers to settle disagreements. Thus all disputes over price, product, and so on must be handled informally (Black, 1983).

The violent effect of neighborhood drug markets can be felt throughout the community (Corsaro et al., 2012). With such an impact on the surrounding area the illicit drug market has been a focus of substantial research for good reason. There is limited consistency in the literature on the reasons for violence surrounding drug market areas. Although this is the case, various researchers have found a relationship between drug markets and violence in the surrounding community (Blumstein & Wallman, 2006; Brownstein et al., 2000; Coomber, 2010; Rosa et al., 1990). Goldstein (1985) puts forward a situational context in which a violent instance could occur.

> Dealers mark an inferior quality heroin with a currently popular brand name. Users purchase the good heroin, use it, then repackage the bag with milk sugar for resale. The popular brand is purchased, the bag is "tapped," and further diluted for resale. These practices get the real dealers of the popular brand very upset. Their heroin starts to get a bad reputation on the streets and they lose sales. Purchasers

> of the phony bags may accost the real dealers, complaining about the poor quality and demand their money back. The real dealers then seek out the purveyors of the phony bags. Threats, assaults, and/or homicides may ensue (p. 497).

As noted by Goldstein, much of the violence stems from retaliation measures used instead of legal mediation (Goldstein, 1985; Jaques, 2010). Goldstein goes further as he lists three types of violence caused by illegal drugs. Economic–compulsive violence is brought on by the drug user's addiction. As the user must maintain their use of a drug, they will assume measures such as robbery and property crimes to help finance their addiction. These criminal acts typically take place in close approximation to drug markets, making them areas with high levels of victimization. A second type of violence is systemic violence, which are aggressive patterns inside the larger system of drug use and distribution. Some examples include:

1. Disputes over territory between rival drug dealers.
2. Assaults and homicides committed within dealing hierarchies as a means of enforcing normative codes.
3. Robberies of drug dealers and the usually violent retaliation by the dealer or his/her bosses.
4. Elimination of informers.
5. Punishment for selling adulterated or phony drugs [as discussed above].
6. Punishment for failing to pay one's debts.
7. Disputes over drugs or drug paraphernalia.

8. Robbery violence related to the social ecology of copping areas.

(Goldstein, 1985, p. 496).

An additional type of drug market related violence is political violence against state officials (Reuter, 2009). Lastly, psychopharmacological characteristics of the drugs affect the user and can cause violence. Here the nature of the drug itself brings on behavior that can be violent (Goldstein, 1985).

An alternative explanation for the relationship between violent crime and illegal drug markets was posited by Resignato (2000). This study found that an increase in drug enforcement has a stronger relationship with violent crime than the use and selling of drugs (Resignato, 2000). The findings by Goldstein (1985) and other more current scholars (e.g., Resignato, 2000) are that psychopharmacological, economic and systemic effects of an existent drug market increase levels of violent crime. The other argument is that "drug-related violent crime is more likely the result of systemic factors caused by drug prohibition and increased drug enforcement" (Resignato, 2000, p. 688). His study strongly suggests that enforcement policies and laws are indirectly responsible for increases in violent crime.

This concept is further extended in a recent article that examined law enforcement intervention. In this study by Corsaro et al. (2012), increasing the intensity of illegal drug market policing in micro-level drug distribution hot-spots was found to decrease violence in that specific location but increase violent crime on a macro-level across the city. This suggests that it is not only the street corners that are affected by drug markets, but that the surrounding area feels the impact through displacement.

When it comes to drug markets there are specific risks associated with certain demographic characteristics. As discussed earlier, demographic measures are key variables used in many studies that use routine activities theory (Mustaine & Tewksbury, 1998) and social disorganization (Bursik, 1988). Its application is not absent in this study either. Ousey and Lee (2004) determined that drug markets have a positive impact on lethal violence, but more so for African Americans than Caucasians.

It is evident that researchers do not agree on the mechanism of the connection between violent crime and illegal drug markets. Studies from Goldstein (1985) to Corsaro et al. (2012) have found that a link does exist between violent crime and drug markets. One of the more interesting findings by Patillo (1998) suggests that the level of the social organization in a neighborhood is a continuum. For absolute social disorganization to exist there must be no level of legitimate social organization. Illegal drug market networks may fill the void of a socially disorganized context. For illegal drug markets to exist social organization must be at a lower level in the continuum (Patillo, 1998).

Firearm Availability and Homicide

The use and ownership of firearms is a protected right under the *U.S. Constitution* (District of Columbia v. Heller, 2008). What is clear is that firearms have become an accepted component of U.S. culture. The ownership rates per household in the U.S. are higher than any other developed nation in the world (Killias, 1993). Regardless of legal restrictions, firearms are consistent with the American value of individualism. This is important to note as the following discussion of the literature will attempt to take an objective stance avoiding partisan discourse.

Gun availability has been measured in a variety of ways (e.g. Cook, 1979; Kellerman, Rivara, Rushforth, Banton, Reav, Francisc, Locci, Prodzinski, Hackman & Somes, 1992; Kleck, 2004). More reliable measures are developed through surveys such as the General Social Survey (GSS), which is national in scope (Hepburn et al., 2004). Since this is the case, scholars who are interested in studying gun availability on the state, county, and lower-levels have had to create approximate measures for gun availability. Cook (1979) was one of the first to create a city-level measure of gun availability. Known as Cook's Index, it is the proportion of homicides where a firearm is involved (FH/H) with the percent of suicides where a gun is used (PS/S) (Cook, 1979; Hemenway & Miller, 2000). Before Cook (1979), Krug (1967) used the rate of hunting licenses to gain a measure of gun availability; this demonstrates the variability in the measures that have been developed. Additionally, and important to the current study, is the percent of crime where firearms were used during the offense to gain measure gun availability (Kleck, 1984; McDowall, 1991). There have been attempts to determine the most reliable approximate measure. Various scholars have pointed to percent of suicide with guns PS/S as among one of the more reliable measures of the accessibility of firearms because of its high correlation with survey-based data (Kellermann et al., 1992). Kleck (2004) examined over a dozen proxy measures of gun availability that have been used throughout the literature. He concludes that with the exclusion of survey measures, the most valid macro-level gun availability measure is PS/S.

Understanding the impact firearms play in certain contexts is of great importance theoretically. The opportunity to commit the offense may be based on context and three factors: offender motivation, target suitability, and capable guardianship. As discussed in Chapter 2, the suitability of a target, the capability of guardianship, and the motivation of the offender may be

influenced by the presence of a firearm. Additionally as Cook (1981) suggests, there is a vulnerability pattern of those who are victimized by gun use. A "gun is particularly valuable against victims who are physically strong, armed, or otherwise relatively invulnerable—the gun is the great equalizer" (Cook, 1981, p. 65). The potential offender becomes more motivated with the firearm as it increases the likelihood of success. It is unclear who first stated, 'God may have made men, but Samuel Colt made them equal,' but it fits the current context. It may even be that motivated offenders will seek out firearms to assist in their crimes[2]. Cook offers that if guns as weapons were substituted with something less efficient, homicides would decrease, although robberies and other crimes would maintain current levels (Cook, 1981).

Macro-level cross-national studies and micro-level studies have been conducted to determine the effects of gun availability on violence. One such study that examined a national sample found that increased gun availability is positively related to violence across the country (Hoskin, 2001). This was consistent with an international-level study done by Killias (1993) using survey measures of 14 high-income nations that found that both homicides and suicides are positively correlated with the presence of a gun in their household. Another such study found that gun availability (FS/S) was a strong significant predictor of homicide across 26 high-income nations (Hemenway et al., 2000). This result was also found in all regions of the United States as gun ownership had a strong correlation with firearm-related homicide and suicide (Kaplan & Geling, 1998). Additionally, Miller, Azrael, and Hemenway (2002) find a consistent pattern

[2] Previous studies such as Stolzenberg and D'Alessio (2000) used the measure firearms stolen as a measure of illegal gun availability at the county-level. It is unclear if those who steal firearms for their own use or distribution only do so in the county they will use or illegally sale the firearm. The term, availability, then may vary depending on proximity and means of transportation of guns by the illegal seller or buyer.

among age groups as a positive predictor of homicide was gun ownership rates for all ages with the exception of 0-4 year olds.

Even more recent studies have found similar effects as increased accessibility to firearms adds to the risk of violent crime. In 2007, using a survey of household gun ownership it was found that states with a higher level of firearms had significantly higher homicides for men, women and children (Miller, Lippman, Azrael & Hemenway, 2007). To gain a full understanding of firearm's impact on homicide or lethality at a macro-level, previous scholars have accounted for available guns on the legal and illegal markets. Two studies differentiate between illegal and legal guns. Stolzenberg and D'Alessio, utilizing data from the National Incident Based Reporting System (NIBRS), uses the stolen firearm variables as an approximate measure of illegal gun availability in South Carolina. Additionally, the researchers use concealed carry licenses as a measure of legal gun availability. They determine that illegal gun availability is positively related to violent crime, while legal gun availability was found not to have a significant relationship with violent crime (2000). Marginally diverging from these findings Haas, Jarvis, Jefferis, and Turley (2007) utilizing the same measures as Stolzenberg and D'Alessio (2000) for a different state, West Virginia. They conclude that violent crime is related to both legal (concealed carrier) and illegal firearm availability (stolen firearms).

As the literature notes, when possible, targets respond to their risks of being victimized. Those in locations where high levels of violent crimes exist, such as drug markets, decrease their vulnerability by arming themselves (Blumstein, 1995). A relevant predictor of increases in adolescents carrying guns is the level of youth violence in the area (Cook & Ludwig, 2004).

Escalation effects offer some explanation in these locations as there is an approval of self-defense. As one's perceived victimization risk increases, so does their likelihood of carrying a gun. Sheley and Wright (1993) provide consistent findings that the primary reason juveniles carry firearms is due to the perceived need to be protected. In short, their examination emphasizes adolescents' gun carrying habits as responses on the criminogenic features of an area.

Although the perceived need for self-protection is a reason for gun carrying, the risk of victimization may not be hindered, but instead enhanced, by gun ownership. Although it seems reasonable to own a gun for protection in such environments; other studies suggest that residents in households that own guns have a higher chance of being victims of homicide (Hepburn et al., 2004). Spano et al. (2008) found that gun carrying increased victimization risks among gang members and the employed. The study also found that routine activity variables such as lifestyle, demographics, and other family factors mediate the relationship between gun carrying and violent victimization risks (Spano et al., 2008).

Overall, the finding in this review is the consistent nature of the relationship between firearm availability or ownership and violent crime (Hepburn et al., 2004).With the availability of only proxies, at state-level or below, there are various ways of conducting a test to determine if gun availability mediates a relationship between drug markets and homicide. Although FS/S emerges as a strong predictor, there have been other studies that utilized other scales or measures. For instance, Haas et al. (2007) followed Stolzenberg and D'Alessios (2000) by employing two measures, concealed carry licenses and the total number of stolen firearms.

As discussed, gun availability measures range from concealed carry licenses, FS/S, and firearm surveys to stolen firearms in the area. The problem has been that accounting for the number of legal and illegal firearms at lower level aggregates, such as counties, is difficult. Approximate measures must be used to account for the number of guns in a specific location. Another consistency from this review is that each measure has its own weakness. For instance, not all legal users receive a conceal carry license and, depending on the state law, such licenses may or may not be transferred. FS/S has provided one of the most reliable measures of gun availability, yet the measure is available only through the Center of Disease Control, and is now inaccessible for counties that have three or fewer suicides with a firearm per year. Firearm surveys also provide much promise, but many surveys are implemented at the region or state level and privacy or safety concerns by gun owners may make the data less accessible. Lastly, stolen firearms in a county does not account for potential transportation of the firearm. Even without large or elaborate illegal firearm transportation routes, a stolen gun may easily be related to an offense in an adjacent county. Specifically, county or city firearm restrictions may lead to more stolen firearms in adjacent counties or cities with fewer or less intense restrictions. In this case there can be a data disconnect between a stolen gun in one county and a homicide with that same gun in the adjacent county. Due to these weaknesses or limits on the data that can be accessed, a new gun availability measure is created for the current study from NIBRS (2010). Discussed more thoroughly in Chapter 4, the measure addresses the weaknesses of previous measures, as it distinguishes between legal users and illegal users, while accounting for transportation.

Drug Markets, Firearms, and Homicide

The current review has gone through specific variables in relation to homicide. This section provides a brief discussion of how all the factors discussed impact the others in relation to homicide. As discussed previously, crime incidents are argued to be non-random. Routine activities and social disorganization theories supply researchers with the ability to better understand how contexts and routines, lifestyles and demographics can increase or decrease the likelihood for a crime to take place (Mustaine & Tewksbury, 1997). Increased exposure to locations, such as socially disorganized neighborhoods where potential offenders are present, will increase one's likelihood of being a victim of a violent crime. Consistent with the routine activities and social disorganization perspectives, Vaughn et al. (2012) found that those who are involved in the drug trade while carrying a firearm are more likely to have been involved in violence than those who do not carry a firearm. Additionally, adolescent males who are involved in drug markets have an increased likelihood of carrying firearms.

Blumstein (1995) highlights the relationship between drug markets, violence, and gun availability as he finds that youths who engage in drug markets arm themselves for self-defense. Adolescents fall into what Blumstein calls an "arms race" that escalates the lethal violence among participants in these drug markets. An article by Blumstein and Cork (1996) finds that increases in the drug market in New York coincided with an escalation of gun-related homicide among juveniles. This study shows that there was a demand for guns by juveniles who participate in these markets, thus adding to gun-related homicide rates. Blumstein and Cork suggest that those in the surrounding community are impacted indirectly by those dealers in the

illegal drug market who carry guns, thus leading to an increase of firearms throughout the community. Here, Blumstein and Cork use an indirect measure of gun availability through the use of mortality detail files. The authors infer that since there is an increase in gun homicide that there must be an increase in guns in the market (Kleck, 2004). The assumption that one firearm equals one homicide is specious since one firearm can be responsible for multiple homicides or none.

Consistent with these findings a more recent study has determined that those who participate in drug markets are likely to carry guns (Felson et al., 2011). The authors differentiate between different markets as they find that those who work in crack-cocaine markets are more likely to carry guns than those involved in marijuana, opiate, and powder cocaine markets. Those who operate more in crack-cocaine markets tend to be African-American and at a low socioeconomic status. Additionally, amphetamine and barbiturate markets have a high level of gun carrying participants.

Using NIBRS data, Weaver, Clifford, Huff-Corzine, Corzine, Petee, and Jarvis (2004) find that drug-related crimes have a higher level of lethality than those crimes that are not related to other drug offenses, thus supporting the drug and violence link. Situational contexts such as demographic characteristics of the victim and offender were found to be predictors of lethality. Women are also more likely to die due to criminal violence. One of the more important aspects of this study is the powerful impact weapons have on the likelihood that the violent crime ends in a lethal way. The effect in this study was largest for firearms. Here the use of guns in violent crime is the strongest predictor of lethality. The authors posit an escalation effect as “males are

more likely to resist an attack, leading to an escalated level of violence from the assailant" (Weaver et al., 2004, p. 362). This hypothesis brings forth another aspect to this topic as guns can be used by the target, offender, and guardian. This increases the odds that the violent crime will produce a lethal outcome for one of more of the participants. It should be noted the creation of policy to address these issues is not an easy prospect. Police intervention into these markets has been met with much resistance by offenders. A review of drug market research found that gun violence and homicide increase once police attempt to disrupt these markets (Werb et al., 2011).

Here we see how a socially disorganized location, drug markets, creates the exposure and opportunity for criminal violence to take place (Shaw & McKay 1942). These contexts become difficult to disrupt without increased violence due to the illegal organization that has formed in the community. Such an organization, policy-wise, is difficult to dismantle once it has gained a foothold in the area. As demonstrated above, certain contexts have weak legal community networks that provide a void for criminal networks to form, thus providing fertile ground for motivated offenders, suitable targets, and an absence of capable guardians. Again, increased exposure to a location with armed drug dealers and incapable guardians increases the risk of victimization through violent crime.

Few studies have specifically analyzed the relationship between illegal drug markets, gun availability and homicide. Additionally, to the author's knowledge no study has yet to test if gun availability mediates the reported relationship between drug markets and homicide. Also important is that the differences in drug markets between rural and urban locations are more fully

understood as the relationship of homicide and gun availability is explored. The current study fills an important gap in the literature as more refined measures will be utilized in the analysis of the relationship between guns, drug markets, and homicide.

Shown in Figure 1 are the hypothesized relationships between the key variables in this study. As discussed earlier and demonstrated in the diagram, gun availability acts as a mediator between drug markets and homicide. It is argued that a relationship exists between drug markets and homicide. Yet, when the gun availability measure is included in the analysis the strength of this relationship is decreased and gun availability provides a significant pathway for the relationship between drug markets and homicide. More precisely, it is hypothesized that drug markets are violent contexts, but gun availability impacts the lethality of these locations.

All measures are developed from NIBRS data and the U.S. Census; both provide measures that are utilized in the current study. Additionally, the county-level analysis allows for an examination of rural locations in comparison to urban ones. I argue that a positive relationship exists between drug markets and homicide and that this relationship is mediated by gun availability. In addition, I propose that within this relationship there is a difference in rural and urban location. The following chapter will further explain the methodological strategy that will be employed in the current study.

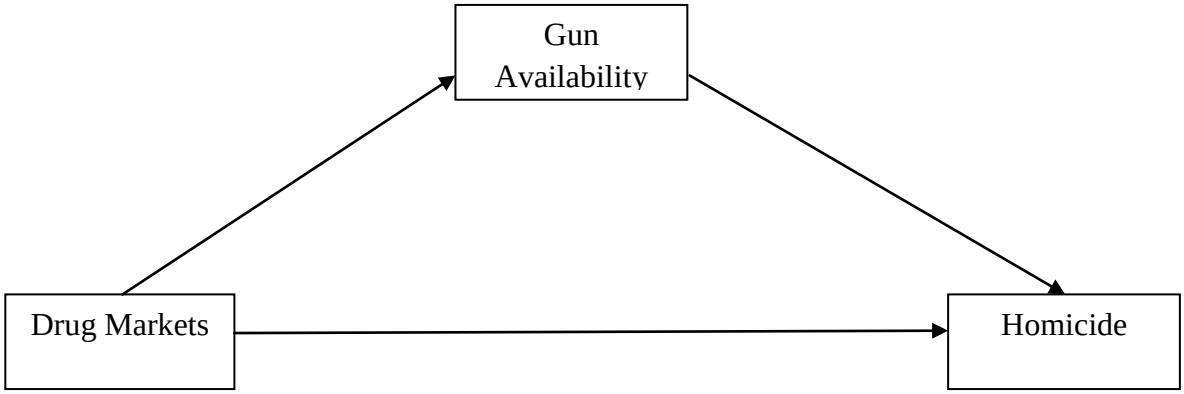


Figure 1: Proposed Variable Relationship

CHAPTER FOUR: METHODOLOGY

The units of analysis for this study are counties in the states of Virginia and Iowa. These two states are chosen for the current study as they are both fully NIBRS compliant[3] and are regionally, culturally, and geographically disparate. Additionally, the states have the most counties out of all fully compliant NIBRS states. There are a total of 95 counties with 39 independent cities in the state of Virginia. It should be noted that the independent cities are urban areas within counties. If the population of the city reaches 25,000, it may be treated as its own sovereign county. I treat the independent cities as counties in this analysis. Virginia is one of the highest populated states that reports to NIBRS, as there are approximately 7,841,754 residents (NIBRS, 2010; U.S. Census, 2010). A total of 15 counties in Virginia have populations over 100,000 (U.S. Census, 2010), accounting for several urban centers. The state offers distinct regions and topology types, including farmland, the Atlantic Beach Coast, the District of Columbia suburbs and the Appalachian Mountains. This provides a significant variance of cultural backgrounds. Virginia is a moderately heterogeneous state as Caucasians represent 68 percent of the population, while African Americans comprise around 20 percent. Hispanics make up approximately 8 percent of Virginia's population. The rest of the population is comprised of less than 10 percent of Asians, Pacific Islanders, Alaskan Natives, Native Americans, and other demographic groups (Census, 2010).

Although Virginia seems ideal, the literature makes note that its region carries many trends with it. As a Southern state, Virginia may have higher levels of violence (Corzine, Huff-

[3] To be considered for the current study the state must have been completely NIBRS certified. Additionally, 100% of the agencies in the state must report data to NIBRS.

Corzine & Whitt, 1999).Although Virginia is not a Deep South state, scholars have shown that a *subculture of violence* might resonate in the southern census region (Messner, 1983; Corzine et al., 1999; Copes, Kovandzic, Miller & Williamson, 2009). This has been also termed a *culture of honor* by other scholars as to reflect religious and traditional norms of the South (Messner, 1983; Nisbett & Cohen, 1996; Copes, Kovandzic, Miller & Williamson, 2009; Felson & Pare, 2010). Regardless of the terminology, evidence demonstrates that this effect could bias the data, especially since these studies have found that traditional violent crime predictors, such as poverty, are impacted by the *culture of honor* (Messner, 1983; Nisbett & Cohen, 1996; Miller & Williamson, 2009; Copes, Kovandzic, Felson & Pare, 2010).

There are 99 counties in Iowa. The state holds less than half the population of Virginia, 3,016,267. There are a total of 6 counties that have populations of 100,000 or higher. Iowa is a primarily rural state with farmland and some small urban centers. Iowa is largely homogeneous demographically as 92 percent of the population is Caucasian. It is a Midwestern state that does not hold a Southern tradition associated with violence.

Virginia and Iowa are chosen for various reasons. One that weighs heavily on the current study is their number of counties. Each county is a case in this study. As both Iowa and Virginia are compared to account for regional differences it was important that they had enough counties to draw statistical conclusions. Out of the states that are fully compliant with NIBRS, Virginia and Iowa have the most counties. In part, this is one of the reasons these states were chosen for analysis as they more units of analysis than any other state. Because states are heterogeneous units of analysis, counties are preferable for the types of analysis used in the current research.

Although census tracts are more homogeneous than counties, NIBRS data are not available at the census tract level.

Additionally, Virginia and Iowa are chosen due to their economic and social differences; they vary in region, heterogeneity, urbanity, and population. Because of this variation, Iowa allows for a fruitful comparison to Virginia. Also, the cultural and demographic differences between the states increase the potential generalizability of this study. All rural and urban counties in both states are examined in pertaining to gun availability and the relationship between illegal drug markets and homicide.

Data Sources

Iowa and Virginia are NIBRS compliant, bringing a level of specificity and reliability to the data. The use of NIBRS allows for more knowledge to be gained about the link between violent crime and drug markets. Without the NIBRS database the current study would not be possible. NIBRS provides both the explanatory variables and the dependent variable for the study. Since this is the case the current study relies on incident-level police reporting. Furthermore, since the hypothesis-based variables are taken from NIBRS, the current study should also be understood as a test of NIBRS' potential and capabilities of accessing crime data at the county-level.

Using county-level data provides a unique opportunity to learn how lethality in areas with high levels of drug use is influenced by the presence of firearms. NIBRS is aggregated on the agency-level, thus the current study is unable to analyze the data at further micro-levels. County-

level data is utilized over agency-level data to increase reliability of the sample.[4] Additionally, crime response policies often utilize county-level designations (i.e., High Intensity Drug Trafficking Areas [See below for further information on these areas]). Furthermore, a variable used in this study, Metropolitan Statistical Areas are regions that are based on county-lines. For these reasons counties are the preferred unit of analysis, but they are not without statistical and theoretical limitations that are discussed in Chapter 6.

The crime data used for this study came from the National Incident Based Reporting System (NIBRS, 2009; United States Department of Justice, 2009). Scholars, law enforcement, and government officials use NIBRS as a reporting system for known crimes. A wide variety of incident-based data is gathered from crimes that are under the scope of law enforcement. Incident details that are reported into the system include but are not limited to offense, offender, and victim information. Several agencies make up the NIBRS reporting system. In 2009, approximately 18,000 agencies[5] reported crime data to the UCR. The program is a part of the nationwide Uniform Crime Reporting (UCR) Program. UCR data have been used to measure crime on a national-level since the 1930s (FBI, 2009).

NIBRS data contains six data segments. These include administrative, offense, victim, offender, property, and arrestee data. In total 57 data elements are captured in this process. Since NIBRS is a relatively young program, there are still many states that have yet to fully complete

[4] The practice of police agencies transferring their NIBRS data to other cities in the area creates an issue of reliability. Agencies that rely on other cities and agencies to record their data creates error as transferred data may be grouped in with the other agency's NIBRS data. County-level data are utilized to reduce this error, but the problem is not completely ameliorated.
[5] These include college, state, county, federal and tribal agencies.

implementation. States that are fully compliant to NIBRS include Delaware, Idaho, Iowa, Michigan, Montana, New Hampshire, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, and West Virginia (Bureau of Justice Statistics, 2009). As noted earlier, the states that are fully compliant with the most counties are Iowa and Virginia.

The majority of agencies across the U.S. do not report NIBRS data to the FBI at this time. Iowa and Virginia are two of few states that are fully NIBRS compliant. The choice of states is limited in this study due to their compliance with NIBRS. The current study uses data from the 2010 NIBRS, which is currently the latest available. The year 2010 was chosen for crime data to correspond with the variables from the 2010 U.S. Census. This year is also the final one used for five- year estimates from the American Community Survey (ACS). In the current study, NIBRS provides the dependent variable reported homicides, the main explanatory variable (drug arrests), and the mediator (percent of crimes where a firearm was used or found). In particular, it will assist in explaining the relationship between homicide, gun availability, and drug markets.

The data from NIBRS is provided at the agency-level. Data were aggregated at county-level and then imported in ArcMap. Counties, the units of analysis, were joined with other data through the use of U.S. Census Tiger Shapefiles, providing county-level maps for reference and analysis. Metropolitan Statistical Areas (MSA) as well as drug market counties as discussed below are mapped for reference.

Additionally, the Anselin's Local Moran's I (1995) is taken for all dependent variables (the homicide measure and gun availability) that are used in the analysis as a test of spatial autocorrelation. Anselin's Local Moran's I, or the Local Indicator of Spatial Association (LISA),

is the summation of unit cross-products. Significance is tested through the evaluation of each unit's (or county's) level of clustering. Since county-level spatial units are utilized, the distance method chosen is one where the strait-line between two points are analyzed, or as termed Euclidean Distance.[6] Inverse Distance is used to be sure that closer units have more influence on the final computation (Anselin, 1995; ArcGIS, 2012).

A high positive z-score for a spatial unit means that the surrounding spatial units have significantly similar values ($p < .05$) and will be indicated as High-High (HH). On the other end of the scale a statistically significant cluster of values that are low are indicated as Low-Low (LL). A unit that is a spatial outlier to the unit values around it is represented through a negative and low z-score ($z \leq -1.96$). The indicator for a high value that is surrounded by clustered low values is High-Low (HL). Vice-versa, if a unit holds a low value and high value clusters surround it, it is Low-High (LH). All scores are reported in the results section and should be considered throughout the analysis (ArcGIS, 2012).

It should be noted that LISA does not take into account the statewide observed pattern of values by location. More specifically, LISA checks clustering between and encompassing specific units of analysis. To test the overall level of clustering in the state Global Moran's I is utilized (Moran, 1950). For the current study, the Moran's I tests whether the counties on a plane, or within the certain boundaries of the state or dispersed, random, or clustered. If the test is significant and positively directed clustering is present. A significant p-value with a negative

[6] The alternative option is Manhattan Distance, where two points are measured between angles. This method is more commonly utilized in more micro-level contexts such as city blocks (ArcGIS, 2012).

z-score identifies over dispersion. If the test is not significant the unit values are randomly distributed (ArcGIS, 2012).

Dependent Variable

Social disorganization and routine activities theory posit that crime levels are impacted by context and opportunity. To test these theories, homicide victimization data are utilized as the most reliable crime statistics (O'Brien, 1985). Using NIBRS, I utilize homicide count data for Iowa and Virginia at the county-level. Consistent with other research on homicide, the types of homicide that are included are murder, non-negligent manslaughter and negligent manslaughter. I use the offense segment to gain the UCR offense code and the administrative segment to obtain the Originating Agency Identifier (ORI), city name, and Federal Information Processing Standard (FIPS) codes in NIBRS to establish county-level statistics. The data are imported from NIBRS and placed in an Excel spreadsheet to obtain counts of incidents per county. After diagnostics, I examine frequencies and distributions, I determine if the variable should be entered into the models as a count or transformed into a population-based rate. The decisions were based on the skewness of the dependent variable. A separate database is then created that includes counts of homicide and the measure of drug markets, gun availability, and other control and theoretical variables taken from the U.S. Census and discussed later in the chapter. I then import the resulting data into the statistical software STATA, V11 (2011) for analysis as it is able to perform Poisson-based count models.

Explanatory Variables

Theories of social disorganization and routine activities provide the guide for explanatory variables utilized in this analysis. As explained in Chapter 1, it is hypothesized that gun availability mediates the relationship between drug markets and homicide, more so for urban areas than rural areas. The following sections describe the representative measures for the hypothesis, theoretical constructs, and structural covariates of homicide.

The Creation of a New Statistically Based Drug Market Measure

Previous studies have utilized various approximate measures for drug markets. The most common proxy variable is the drug-related arrests rate (Bernasco et al., 2002; Ousey et al., 2007). It is surmised that as the drug-related arrest rate increases so does the likelihood of the unit location being a drug market. The premise is that the majority of the supply of a certain product would be placed near its distribution location. As approximate measures go, the argument theoretically speaking is consistent with what one might expect. The usage of approximate supply and distribution is given further consideration as no other alternative measure for drug market has yet to be presented. Even though this is the case, there seems to be a level of discontinuity between the nominal term drug market and various continuous measures, such as the drug arrest rate.

With the creation of the Anti-Drug Abuse Act of 1988 appropriations are given to counties that are considered to be high intensity illegal drug markets (The White House, 2011). As shown in Figures 2 and 3, the High Intensity Drug Trafficking Areas (HIDTA) Program designates counties in the U.S. using a categorical dichotomous method. “HIDTAs are

designated by the Director of [the Office of National Drug Control Policy (ONDCP)], in consultation with the Attorney General, Secretary of Treasury, the Secretary of Homeland Security, heads of the National Drug Control Program agencies, and the Governor of each applicable state, may designate any specified area of the United States as a High Intensity Drug Trafficking Area. [The criteria include:]

- The area is a significant center of drug production, manufacturing, importation, or distribution;
- State, local, and tribal law enforcement agencies have committed resources to respond to the drug trafficking problem in the area, thereby indicating a determination to respond aggressively to the problem.
- Drug-related activities in the area are having a significant harmful impact in other areas of the country; and
- A significant increase in allocation of Federal resources is necessary to respond adequately to drug-related activities in the area" (Office of National Drug Control Policy, 2010)

As discussed above and shown in Figures 2 and 3, HIDTA designations are based on the decisions of political officials at varying levels of bureaucracy. Although some decisions may be assisted by crime statistics, designations are subjective and could benefit from some uniform criteria. More specifically, from a policy standpoint a dichotomous variable is preferred as it offers a classification system which assists in isolating locations where intervening strategies may be fulfilled. Methodologically, the creation of a binary variable eases interpretation, tests for

a threshold (which has already been inferred by the categorization of the term drug market), and finally makes summarization of the data more efficient.

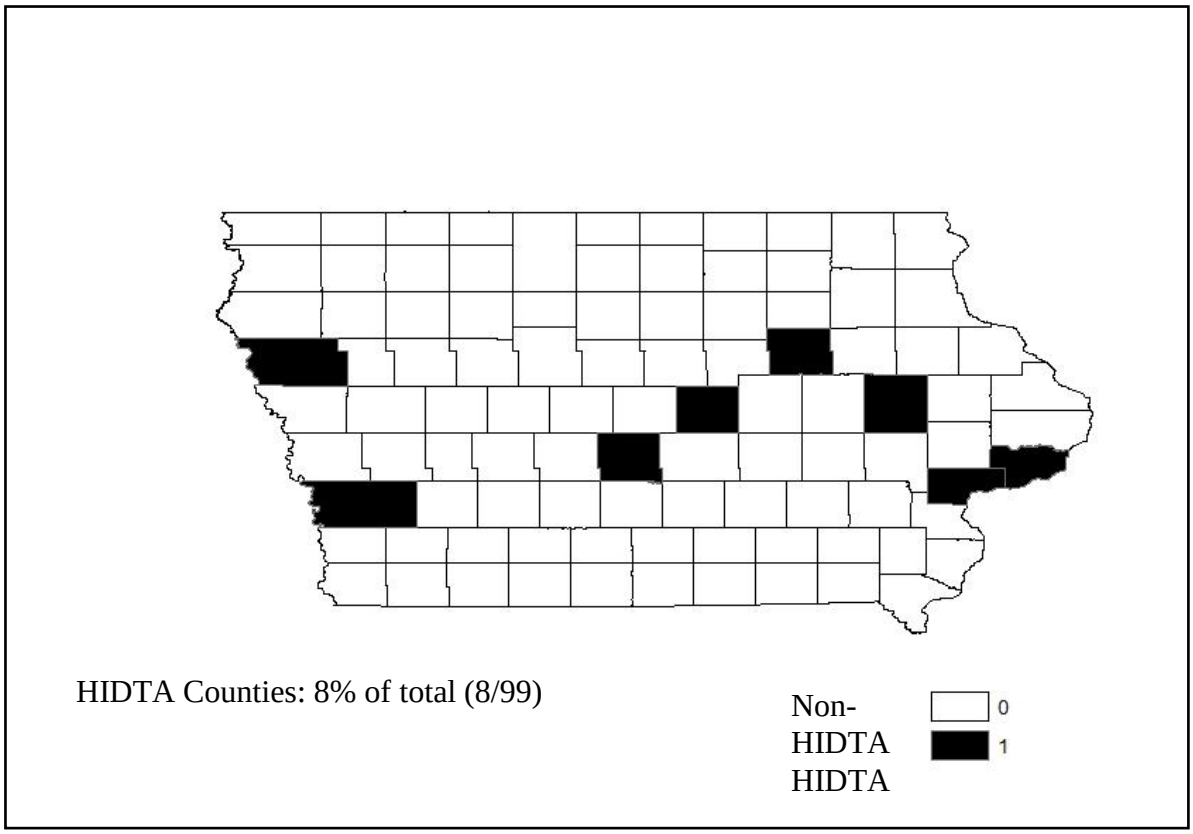


Figure 2: HIDTA Counties in Iowa

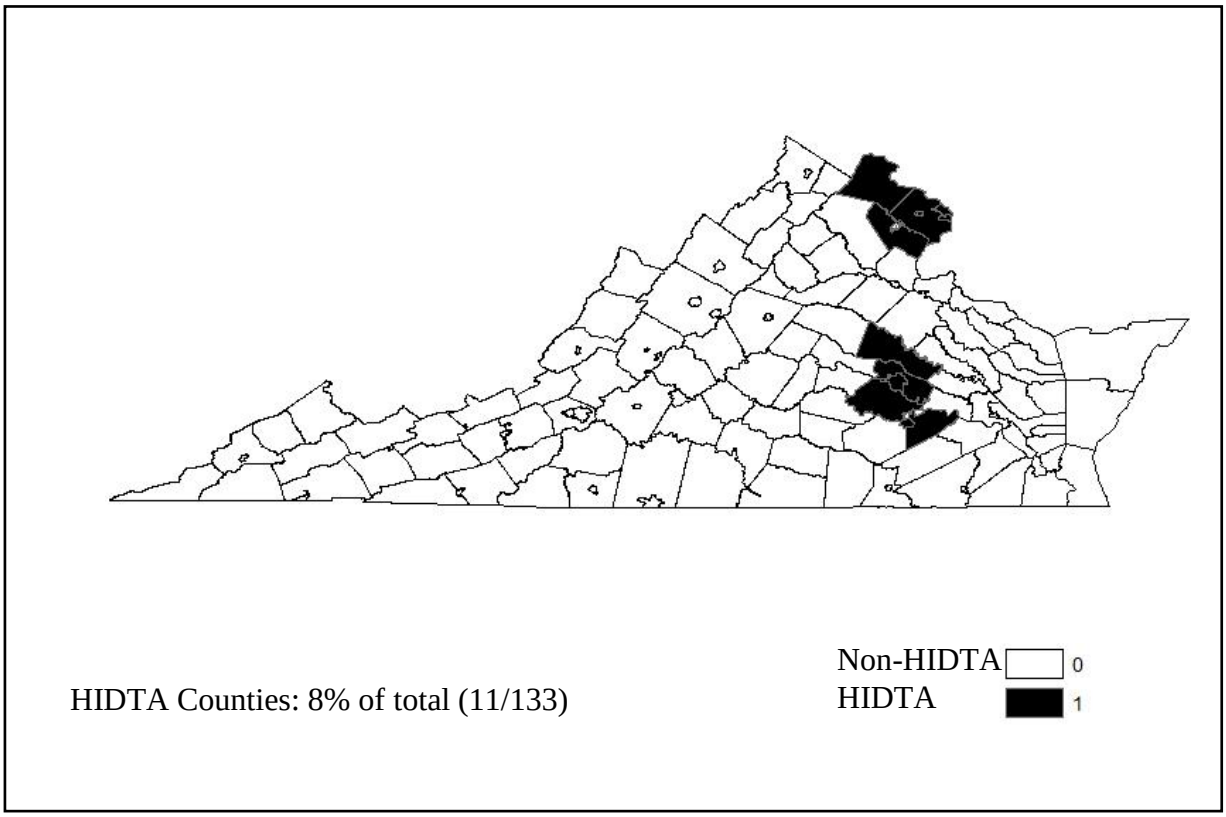


Figure 3: HIDTA Counties in Virginia

The current study propose a statistic-based designation system for HIDTA, I create a new measure for drug markets. Using the previous measure, drug-related arrests per location (county, city, etc.), a dichotomous variable for drug market is created. The new measure is based on model outcomes as to determine an optimal cut-point, or threshold value. There has been much research in the area of sociology, specifically in relation to percent of Black populations and lynching, where it was found that the act of lynching is related to the percentage of Blacks in an area. It was determined that there is a certain cut-point, or threshold, in the percent of Blacks where lynching increased more rapidly (Blalock, 1967, Reed, 1972; Corzine & Creech, 1983).

This cut-point is categorized to predict lynching. Similar procedures are used here to develop a measure of drug markets.

The first step to develop the dichotomous measure of drug market is to add drug/narcotic violations and drug equipment violations from the offense segment of NIBRS 2010 data. Incidents where there is a drug violation and equipment violation are single coded, as to not double up within one incident. Secondly, I employ methods that apply statistical measures to test for the threshold, which creates the estimation of the *best* cut-point for a covariate.

First offered by Cleveland (1979) to determine a tipping point for illegal drug markets, LOWESS regression is utilized. As shown in Chapter 5, Figure 4, a smoothed curve is placed on a scatter-plot of the relationship between drug-related offenses and homicide. LOWESS regression is a type of non-parametric[7] estimate. The relationship of the response variable (homicide count) and the predicting variable (drug-related arrests), without the assumption of linearity, are utilized in the graphical output. LOWESS is a function fitting method of a locally weighted regression where a smoothed curve is graphed. The algorithm is based on local first degree polynomial least square fits, then utilizes robust methods to gain a final fit.

> Assume that for i=1, the ith measurement y_i of the response y and the corresponding measurement xi of the vector x of p predictors are related by [the formula]
>
> $$y_i = g(x_i) + E_i$$

[7] Relies on the assumption that the structure of the model is not fixed.

> where g is the regression function and ^{E}i is a random error. The idea of local regression is that at a predictor x, the regression function $g(x)$ can be locally approximated by the value of a function in some specified parametric class. Such a local approximation is obtained by fitting a regression surface to the data points within a chosen neighborhood of the point x (SAS Institute Inc., 1999, p. 1855).

More specifically, it utilizes a locally weighted process that takes into account neighboring data points that are contained within a span to achieve the best fit (Cleveland, 1979). Importantly, LOWESS is utilized for this analysis over other options due to its flexibility with models as it has no assumption of linearity. Additionally, the smoothness curve is meant to add more clarity to cluttered results. As the curve is used to determine a threshold for variable transformation, having a more definitive cutting-point optimizes its use. Furthermore, LOWESS's feature that allows for bandwidth adjustment assists in clarifying a point where the data are separated by adjusting the sensitivity of the regression spline.

Once a LOWESS smoothed curve is created the graph is analyzed for an observed cut-point (Blalock, 1967). This threshold is the break point between the categories of drug market counties and non-drug market counties. Specifically, the statistic is calculated to determine the appropriateness of the model where drug-related arrest is transformed at the point of slope acceleration. The new measure is coded as (0) non-drug market and (1) drug market. This provides the dichotomous measure of drug markets using a cut-off point of using certain number of arrests per 100,000.

The Creation of a New Firearm Measure

As discussed in Chapter 2, a firearm has the ability of making an offender more motivated, a target more suitable, and guardianship less capable. The presence of a firearm levels the playing field of an armed police officer and an armed offender (Cook, 1981). But does the firearm impact motivation or is it that violent crime offenses occur regardless, and gun availability only impacts the lethality of these encounters? As mentioned in Chapter 2, Kleck (2004) reviews various measures of gun availability. The percent of suicides with a gun (FS/S) is found to be the most valid measure of gun availability beyond survey measures. However, the Centers for Disease Control and Prevention (CDC) has suppressed suicide data in counties with three or fewer suicides for privacy purposes since the time of Kleck's analysis. Additionally, Stolzenberg and D'Alessio's (2000) approach of using concealed carry permits is not available due to similar privacy concerns and aggregation issues in the state of Virginia and Iowa. To capture the concept of gun availability, I create a new measure.

Utilizing NIBRS, I employ three variables, (1) firearm used in the offense, (2) weapons law violation, and (3) firearm found on the arrestee. This measure excludes gun availability be legal users. More specifically, (1) it captures those crimes that are completed or attempted with a firearm (2) it measures those firearms that are misused, and lastly (3) it takes into account those firearms that were found on an individual at the time of the arrest. If any of the variables are coded as one, then the incident is coded as one. A summary measure for each county is calculated by dividing the number of incidents coded as one by the total number of incidents. In other words, the measure captures all incidents in which an officer of the law comes into contact

with a firearm that is either being illegally misused or they find on an offender at the time of arrest. The implication is that the measure captures gun availability among that segment of the population that is more highly involved in criminal activities. It should be noted that for a firearm to be recorded at the time of arrest that the offense does not have to be a violent crime. Instead, the arrest may be for check fraud, but if a firearm is found on the check fraud offender at the time of arrest, it is recorded even for a non-violent criminal engagement. Thus the measure itself is not an approximate measure for violent crime or homicide.

The measure of gun availability in this analysis does not capture those firearms that are undetected by law enforcement. This measure of gun availability focuses on and is concerned with those firearms that are either used or found encompassing a criminal offense. Theoretically, a firearm in a criminal's hands is more of a threat than one in the hands of a law-abiding civilian, hunter, or sportsman. Since this is the case the measure is based solely on police reporting, much like homicide and drug offenses. This is consistent with previous arguments (Cook, 1979; Sheley & Wright, 1993) and reflective of findings by Stolzenberg and D'Alessios (2000) and Haas et al., (2006) that show illegal firearms are more likely to have been involved in the perpetration of a violent offense than a legal firearm. Although the measure here is not of the legal or illegal nature of firearms; it is instead based on the firearm's user. However, an illegal firearm is more likely to be in the hands of a potential offender (Cook, 1979; Sheley & Wright., 1993). The current study does not focus on the legal or illegal nature of the firearm on a micro or macro-level, but is based in more certainty that the owner of the firearm, whether legal or illegal, has committed an offense. Thus gun availability for those criminally-involved is what the measure intends to capture.

As discussed earlier, the gun availability measure controls for the possibility of transportation. The point of illegal use or arrest is the most reliable point of reference. The combination of context, the firearm itself, and its illegal use by an offender should be the focal point of concern. I offer a caveat, as it is important in understanding the location of where the firearm was received and transportation routes/networks.[8] Yet, for the current study uncovering where the firearm was received is secondary to understanding the weapon's final destination. The understanding of where the firearm became an observed social problem is what this study seeks to understand. Thus, the measure in this study reflects the nature of the current research question as it accounts for location and context. It should be pointed out that the dependent variable and main explanatory variables come from NIBRS. This study, as much as it is a study of homicide, drug markets, and gun availability, is also a demonstration of NIBRS capabilities.

Each of the three firearm measures from NIBRS used in this study are dichotomous. I create a new dummy variable that indicates if any of the three variables are coded as 1. Thus if one or more variables are coded as 1, the new dummy variable is coded as 1. If none of the three variables are coded as 1, I code the new variable as 0. Summation is conducted of incidents where there is a firearm violation per county. More specifically, I aggregate the count to the county-level. Once computed a count is created of the number of incidents where guns are involved (weapon law violation, offender used guns, or possession of gun by an arrestee).

[8] Whether these networks or transportation routes are elaborate or condensed in an area is not the concern of the current study. The argument against measures that do not account for transportation of the firearm is strong for lower levels or aggregates of analysis. More specifically, not accounting for transportation of the firearm over county-lines intuitively creates more opportunity for error than state-lines. Firearms that are stolen are more easily transported over county-lines than state-lines, due to the fact that there are more county borders than state borders.

The number of gun-involved incidents are then divided by the total number of criminal incidents per county. The variability of this percentage may be based on many factors. As discussed previously, Cook (1979) provides the framework for such a proportionally based measure as he finds that the overall rate of robbery is not impacted by gun availability, but is positively related to the proportion of those robberies that involved a firearm. More specifically, as gun availability increases so does the percent of those arrested or crimes perpetrated with a firearm. I argue that if there are fewer firearms available there will be less criminal offenses where (1) the arrestee had a firearm at the time of arrest, (2) a weapons law violation occurred, or (3) the offense was perpetrated with a firearm, but not necessarily fewer criminal offenses. The final computation term is the gun availability measure. The measure expands upon a measure used by Kleck (1984) and McDowall (1991). As discussed earlier, they both use the percent of crimes where a firearm is used. The measure is limited by the fact that the firearm must be used in the offense for it to be recorded. The current measure expands on the measures of Kleck (1984) and McDowall (1991) as it adds whether a firearm was found on the offender at the time of the arrest. Thus the current measure further encompasses the former measure with the use of the NIBRS database.

Theoretical Variables

Variables noted by the literature to have an impact on homicide are utilized in the analysis (McCall, Land & Parker, 2010). Many of these variables overlap with the theoretical concepts of routine activities and social disorganization. Theoretically, I argue that social disorganization in the community increases opportunity for offense perpetration. To determine if

drug markets provide a context for crime opportunity to increase, I utilize social disorganization variables.

Racial heterogeneity is a social disorganization measure of integration. The computation of the Simpson Diversity Index (Osgood & Chambers, 2000) captures one such measure of social disorganization, racial heterogeneity. I first collect race data from U.S. Census ACS 5-year estimates for 2006-2010. I then use the raw data to compute the index.

$$(D=1-\sum((n/N)^2)$$

In the above formula, *n* is the count of a specific race, and N equals the count of all races. Caucasian, African American, American Indian, Alaskan Native, Asian, Native Hawaiian, Pacific Islander, and Other are included in the total count. The equation results in the racial heterogeneity in each county. The index theoretically ranges between, 0 and 1, with higher numbers representing greater heterogeneity.

Population change is another variable that is inserted as a control variable, but also provides knowledge of the strength of neighborhood social networks within a county. This variable is taken from the 2006-2010 ACS 5-year estimates. As discussed in Chapter 2, the higher the level of population change in a county, the lower the level of social control and communication networks in the area. I control for population change, or residential mobility, as it is a consistent measure within the integrated theoretical framework. Established by the U.S. Census (2010) it is the percent of those who moved into the unit 2005 or later.

Female-headed households is another measure that is used as a control variable and follows the framework of the integrated theories approach used in this study (Land et al, 1990; Messner & Sampson, 1991; Ousey, 1999 Lanier, 2010; McCall et al., 2010;), as increased female-headed households are indicators of poverty, weaker community stability, and social control.

Unemployment rates are gathered from the U.S. Census 5-year estimates and are the percent unemployed and not in the labor force (2010).Within the theoretical framework unemployment increases the number of suitable targets and decreases community stability.

Control Variables

Population is taken from ACS 5-year 2005-2009 census estimates. Population statistics are also utilized to create rates and percentages per county (McCall et al., 2010). As previous studies have uncovered, ethnic background is an indicator for structural disadvantage and disparities, which may lead to crime (Ulmer, Harris & Steffensmeier, 2012).

Percent Hispanic is utilized as measure of ethnicity (Census, 2010). The measure informs the current study the relationship between ethnic diversity and homicide and other types of criminality

Metropolitan Statistical Area (MSA) as shown in Figures 3-5,[9] is utilized as a measure of urbanity. The measure is defined by The United States Office of Management and Budget. A

[9] Figure 3 is presented for a nationwide reference of MSA, in dark color, by county. Micropolitan Statistical Areas (10,000-49,999 population within an urban cluster) are included in the map and are in light color. Areas that are neither are presented as solid white.

MSA is an urbanized area that holds one or more cities with a population of 50,000 or more. The MSAs used in the current study are based on December 2009 statistics (Bureau of the Census, U.S. Department of Commerce, 2009). Figure 4 is a map of MSAs for Virginia and Figure 5 shows MSAs for Iowa. The measure MSA is brought in for analytical purposes as it eases the interpretation of potential interactions. Additionally, drug markets are distinguished categorically. This means that one illegal drug market location (whether a sale point, transportation route, or storage location) will categorize the county as having a drug market, and one urbanized area that holds 50,000 or more population will define the county as a MSA. Consistency, statistically and theoretically, between the measures of MSA and illegal drug markets are placed at a high priority for analytical purposes. The use of MSA is not without its weaknesses; as a dichotomous measure it lacks variance. All variables have been shown to be structural covariates of homicide (McCall et al., 2010).

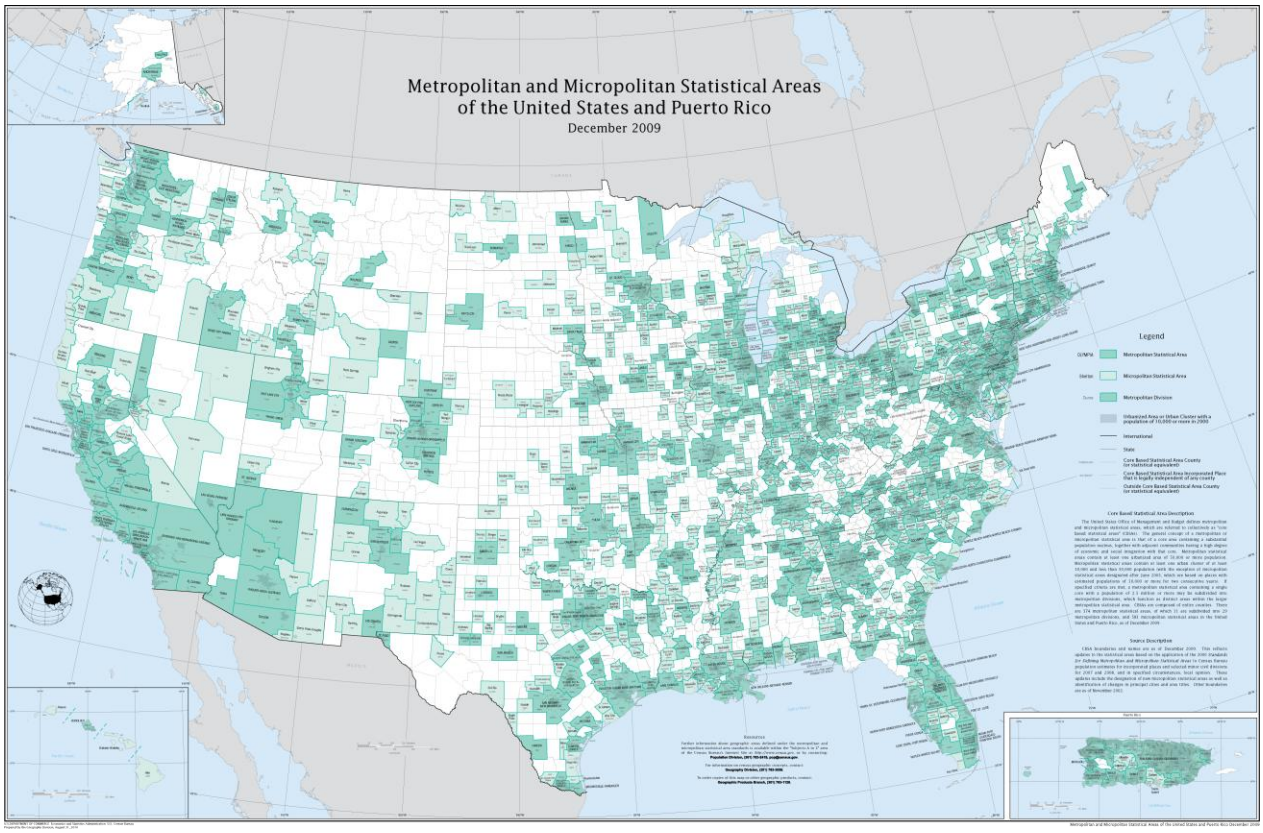


Figure 4: MSA Map: Bureau of the Census, U.S. Department of Commerce (2009). Metropolitan and Micropolitan Statistical Areas of the United States and Puerto Rico.

Figure 5: Virginia MSAs

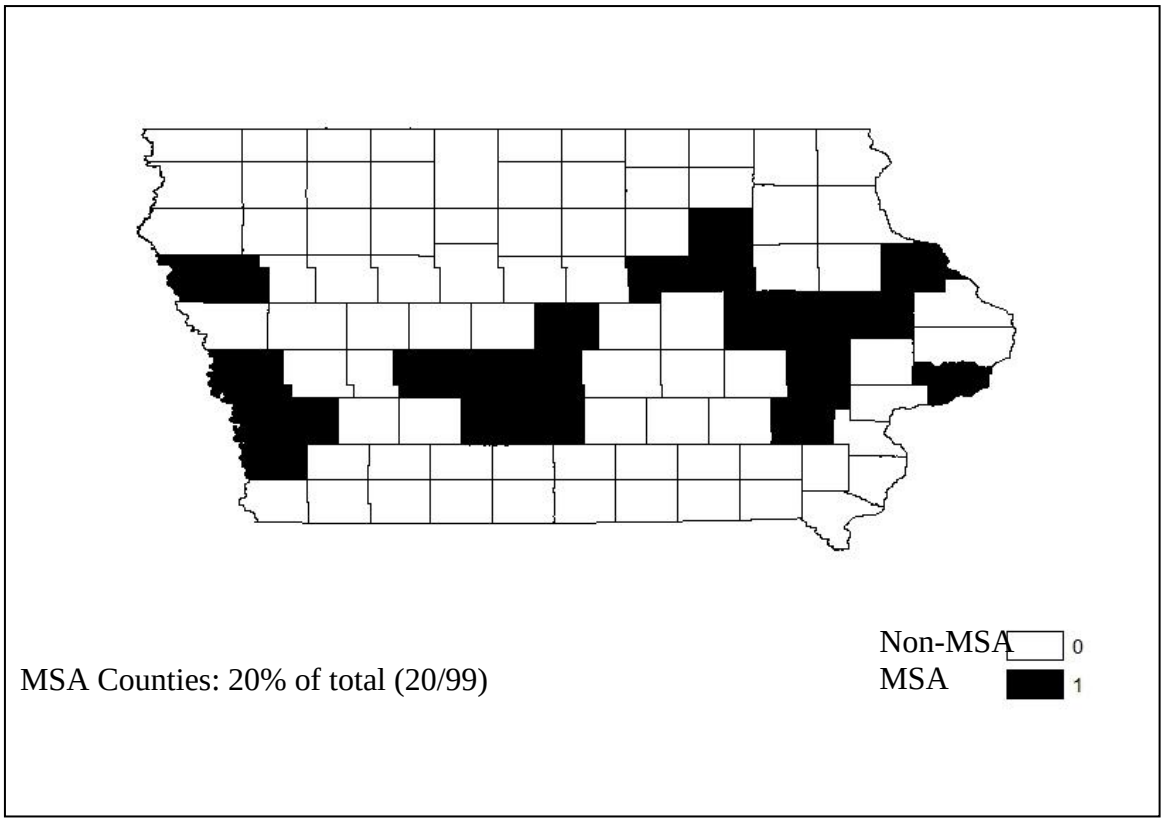


Figure 6: Iowa MSAs

Analytical Strategy

Virginia and Iowa counties are tested both together and apart from each other. Based on previous research, negative binomial regression (NBR) will be utilized in this analysis to test the hypothesis that gun availability mediates the relationship between illegal drug markets and homicide (Osgood, 2000). If a relationship exists between illegal drug markets and homicide, I will then test for mediation. This process consists of three tests, which are based on the criteria for the existence of a mediation effect. First the independent variable, drug market, must be a significant predictor of homicide. I expect this relationship to occur based on previous research and the theoretical premise posed in this study. Second, the independent variable, illegal drug

market, must be a significant predictor of the mediator, gun availability. I expect to find that drug markets have a positive relationship with gun availability. Lastly, the mediator, gun availability, must be entered into the original model. If its addition to the model decreases the strength of the relationship between drug markets and homicide, then it is a valid mediator. Based on findings from previous studies, I expect gun availability to play a significant role in the impact drug markets have on homicide. Previous studies, which have examined the relationship between these three variables, have found a positive correlation (Blumstein, 1995; Werb et al., 2011).

As discussed earlier, NBR and OLS will be used for these analyses. NBR is used in models where the homicide count is the dependent variable. OLS regression is used for the models where the mediator (gun availability) is the dependent variable. I test for significance of mediation with an online test of Calculation for the Sobel test at quantspy.org. Lastly, I determine if the level of urbanity in a county is a moderator within these analyses by creating interaction terms between MSA with gun availability and drug markets. I perform these tests separately for each state. There are three mediation tests in these analyses, (1) with both states, (2) Iowa, and then (3) Virginia. I continue this discussion in Chapter 5, as I provide descriptive statistics of the variables and the results for both states. During this process data transformation will be discussed as county-level statistics are analyzed.

CHAPTER FIVE: PRELIMINARY ANALYSIS AND RESULTS

The following analyses will be given in three sections. The first section will be an analysis of data from all 232 counties from both states. The second analysis will be of Iowa alone (N=99). The third analysis is of only Virginia counties (N=133). Each section will be presented with the same steps and types of analyses. Preliminary analyses will head each section; this will be followed by analyses using the criteria for determining if a mediation effect exists.

Preliminary Analyses: Iowa and Virginia

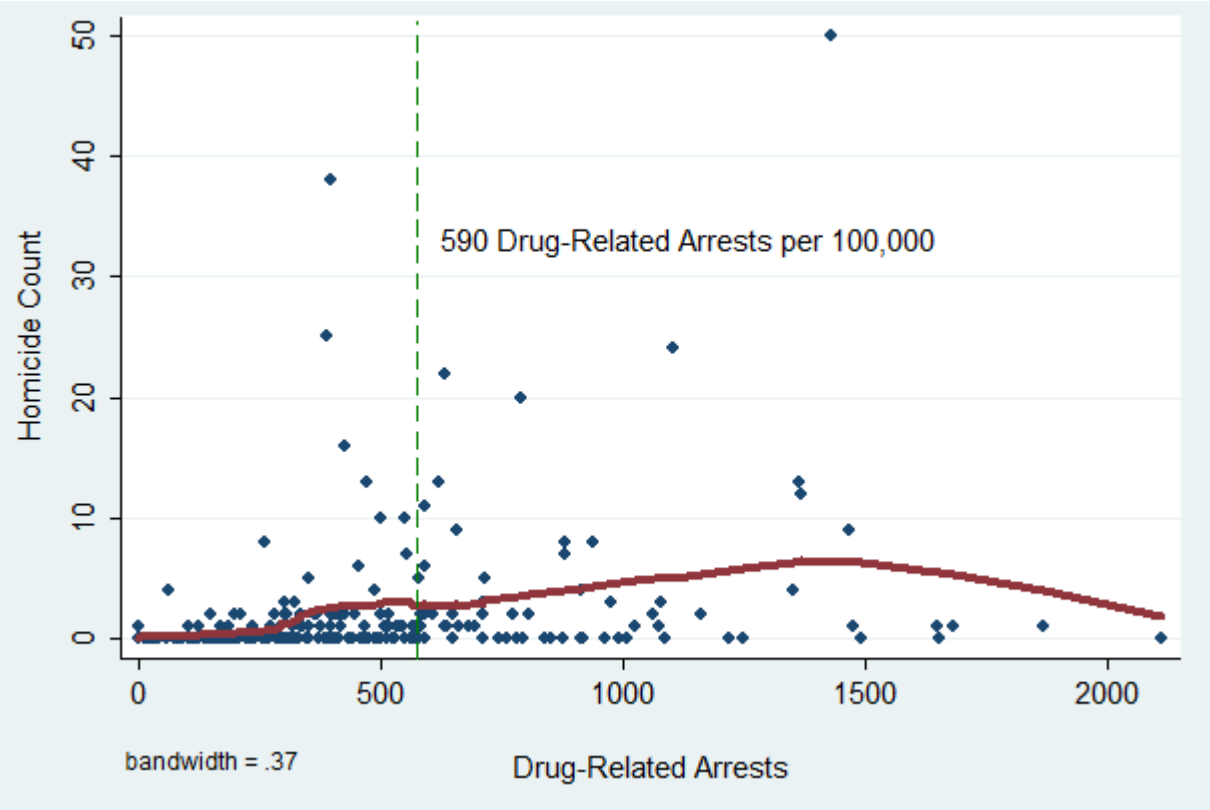
Table 1 shows descriptive statistics for both Iowa and Virginia (N=232).[10] The dependent variable, homicide count, has a mean of 2.08. The county with the most homicides is Richmond City with a total of 50.[11] The variable has a negatively sloped distribution and its standard deviation (SD=5.55) is larger than its mean. The proportion of counties that had zero homicides for 2010 is 57.76% (N=134). For these reasons negative binomial regression is chosen to be the most suitable equation for analytical purposes.

The main explanatory variable is drug market. It is a dichotomous variable so it is given in the proportion of N. A total of 27% of the counties are designated as drug markets for Virginia

[10] Due to data availability, the independent cities of Norton and Clifton Forge in Virginia are not included in the analysis.

[11] Through the Cook's Distance Test (1977) Richmond City in Virginia was determined to be an outlier (Cook's D=1.23). To understand how this impacted the sections for the combination of both states and Virginia alone, analyses were estimated without Richmond City in the models. Although, coefficients were impacted it was not to a significant degree or result in a change in the direction of the relationship. There were no significant changes in the final outcomes for all models where Richmond was included.

and Iowa. As shown in Figures 7 and 8, it is determined through the observation of the smoothing spline that 590 arrests per 100,000 is the drug market threshold for the combination of Iowa and Virginia.



Smoothing Spline determined through the goodness of fit with LOWESS Regression.[12].

Figure 5: Virginia and Iowa LOWESS Regression Drug-Related Arrests and Homicide Count

[12] It should be noted that multiple tests are utilized to determine the tipping point. The original metric is squared and cubed during this procedure to assist in refining the threshold point.

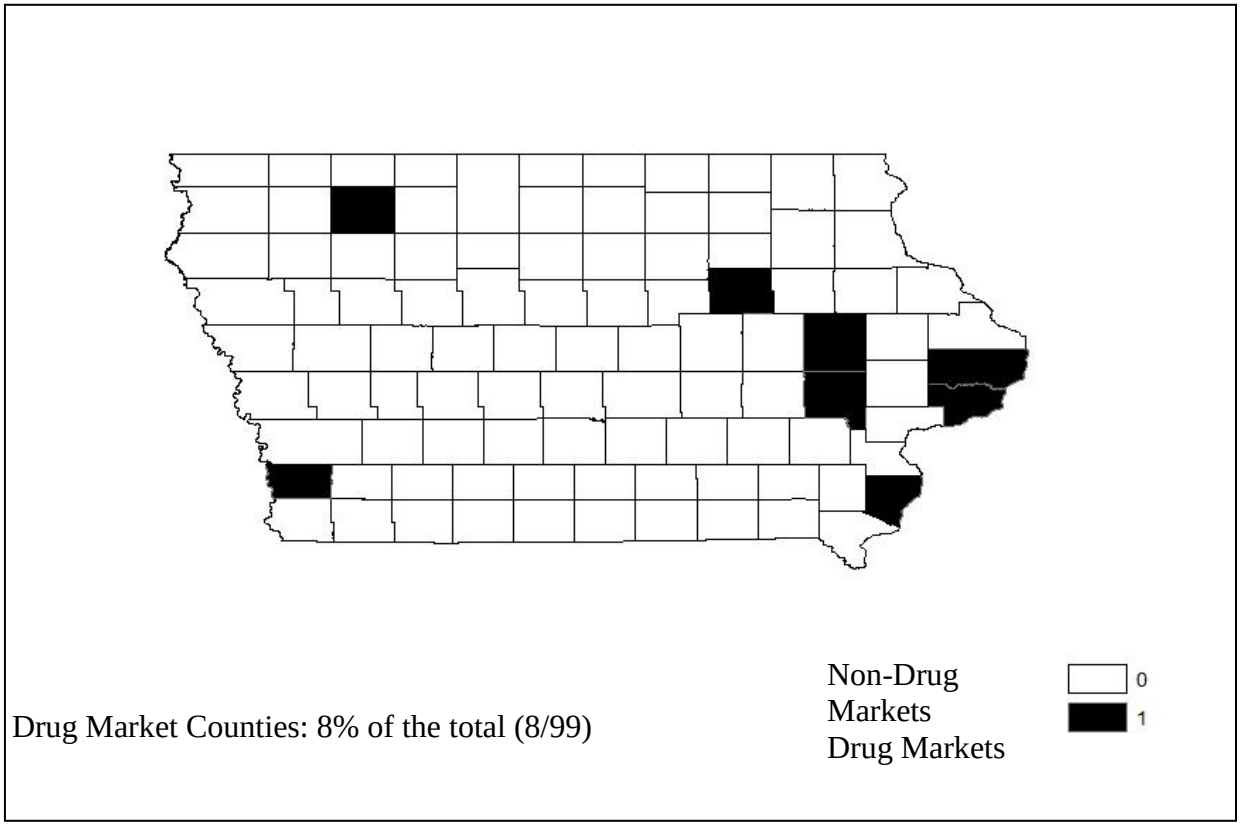


Figure 6: Drug-Related Arrests Threshold Counties for Virginia and Iowa

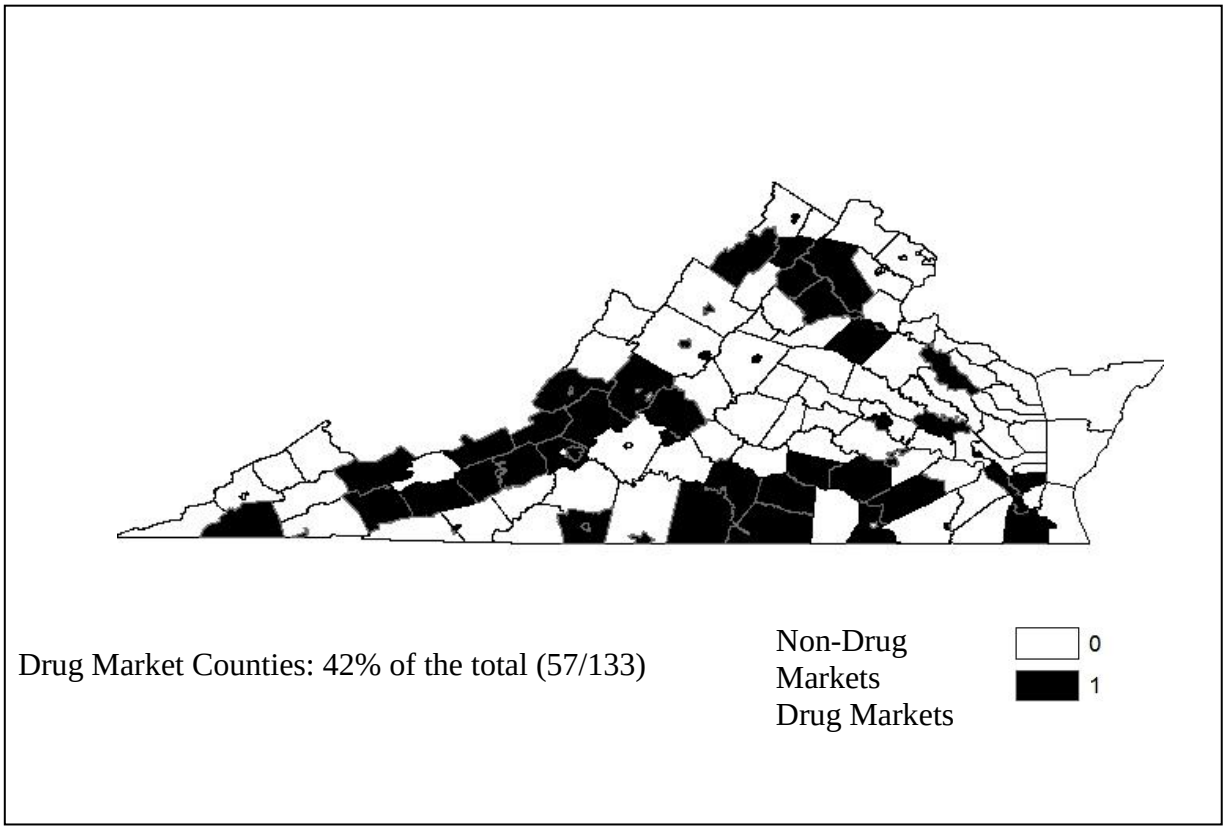


Figure 7: Drug-Related Arrests Threshold Counties for Virginia and Iowa Analyses

The second explanatory variable, and for the current study the proposed mediating variable, is gun availability which has a mean of 23.03 on a percentage scale of 0 to 100. As Chapter 4 discusses, the past measure utilized the percent of offenses involving a firearm. The current study employs multiple indicators for firearms into one construct, gun availability. With the addition of the two other criteria, (1) arrestee was armed during the offense and (2) weapons law violation, there were 12,927 firearms captured that would not have been accounted for with only using the one measure of firearm used during offense.[13]

[13] Specifically there were a total of 10,359 weapon law violations, 13,588 firearms used during an offense, and 2,568 instances of a firearm found on the offender at the time of offense. Because two or more criteria could be met for a single incident, these are not independent cases.

Racial heterogeneity, which is measured through the Simpson Diversity Index, has a mean of 23.58 on a percent scale of 0 to 100. As mentioned in earlier chapters the final computation includes the percentages of the Census covered race variables (Census, 2010). Additionally, it is a reflective measure for the integration of social disorganization and routine activity theory.

The concentrated disadvantage scale is a combination of theoretical variables stemming from social disorganization and routine activity theory. It was determined that the variables percent female-headed household, percent unemployed, and percent in poverty were all positively and significantly related ($p<.001$). To determine if each variable measures the single and unidimensional latent construct of concentrated disadvantage I employ Cronbach's alpha (1951). After testing it was determined that variables meet an acceptable fit ($\alpha=.72$). Z-Scores were summarized to create the new scale. Concentrated disadvantage is utilized for all following analyses. For the combination of both states the mean score is 21.49 with a range from 5.89 to 56.29.

The last of the theoretical variables is residential mobility. It is the percent of those who moved into the unit in 2005 or later. The average percent is 28.89, with a range of 9.20 to 54.00. Metropolitan Statistical Area (MSA) is a dichotomous variable that is examined as the proportion of N. A total of 46% of the counties are designated as MSAs. Percent Hispanic is brought in as a measure of ethnicity. Its mean is 4.21; its skewness value is 2.98. For this reason the variable is transformed as the logarithm is taken to prepare for analyses. Lastly, the total population mean is 47,600.95 with a range of 2,321 to 1,081,726. Its skewness value is 6.62; the logarithm is taken for the variable to prepare it for analysis.

Table 1**:** Descriptive Statistics for Iowa and Virginia Counties (N=232)

Variable	*Mean*	*SD*	*Minimum*	*Maximum*
Dependent Variable				
Homicide	2.08	5.55	0	50
Explanatory variable				
Drug-Market	.28	.44	0	1
Gun Availability	23.03	19.28	0	100
SD/RAT				
Racial Heterogeneity	23.58	18.67	2.38	63.66
Concentrated disadvantage	21.49	9.79	5.89	56.29
Residential Mobility	28.89	7.88	9.20	54
Control Variables				
Percent Hispanic	4.21	4.83	.40	32.5
MSA	.47	.50	0	1
Total Population	47,600.95	95,980.22	2,321	1,081,726

Spatial Autocorrelation

The final section of preliminary analysis details the Local Indicator of Spatial Association (LISA) and Global Moran's I for all dependent variables. This includes the homicide count for both Virginia and Iowa. Additionally, gun availability is used as the dependent variable during the second step of the mediation process; as such it will also be tested. The Moran's I for homicide count and gun availability, the dependent variables used in this study, were not significant for both states ($p \geq .05$). The spatial distributions of the values of the counties are randomly dispersed. The next series of tests are for LISA. As shown in Figure 10, two significantly related clusters were found for the homicide count in Virginia. The first cluster contains the counties of Chesterfield, Henrico, and Colonial Heights. The second cluster holds Virginia Beach, Chesapeake, Norfolk, Portsmouth, York, and Poquoson.

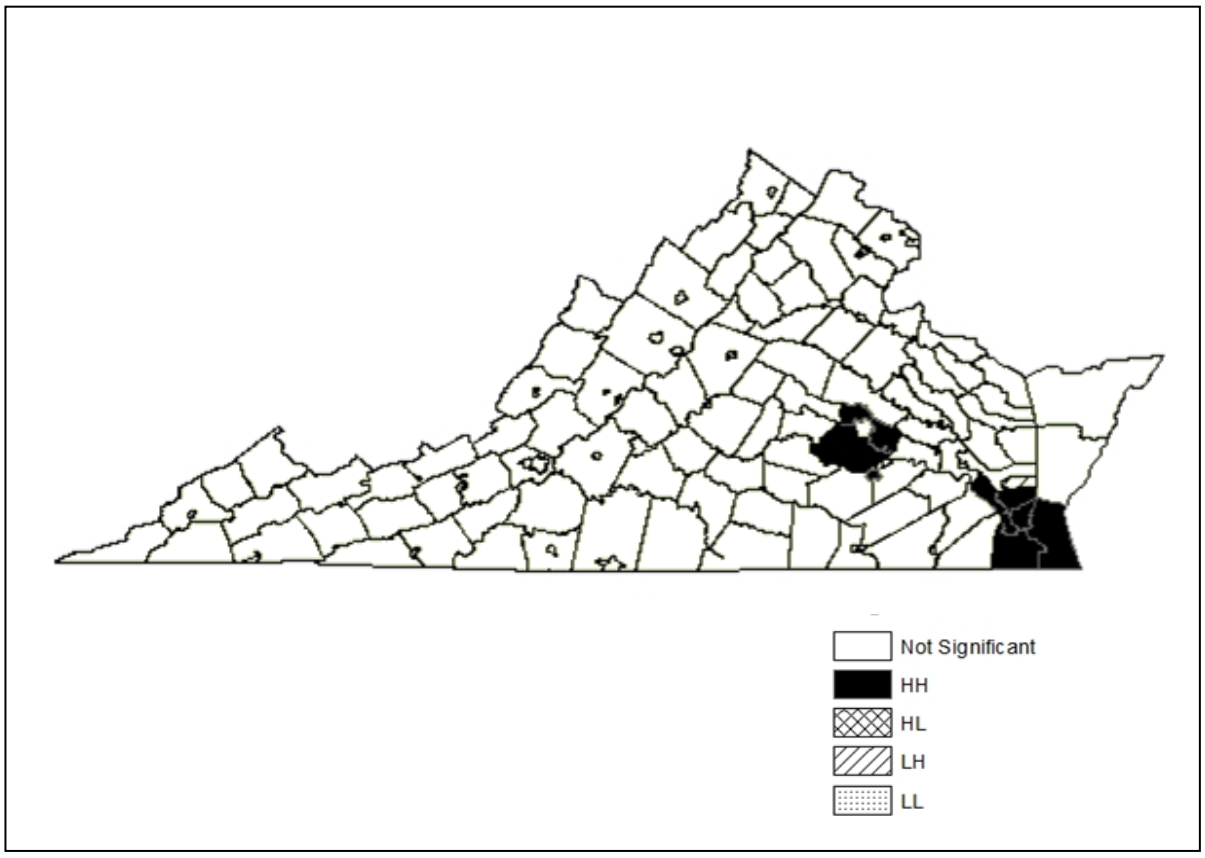


Figure 8: LISA for the Homicide Count of Virginia

Figure 9 displays the LISA for the homicide count in Iowa. Three clusters were identified as having high positively directed spatial autocorrelation. The first cluster consists of Polk and Story counties. The second cluster is of Linn and Johnson Counties. The cluster contains Clinton and Scott counties.

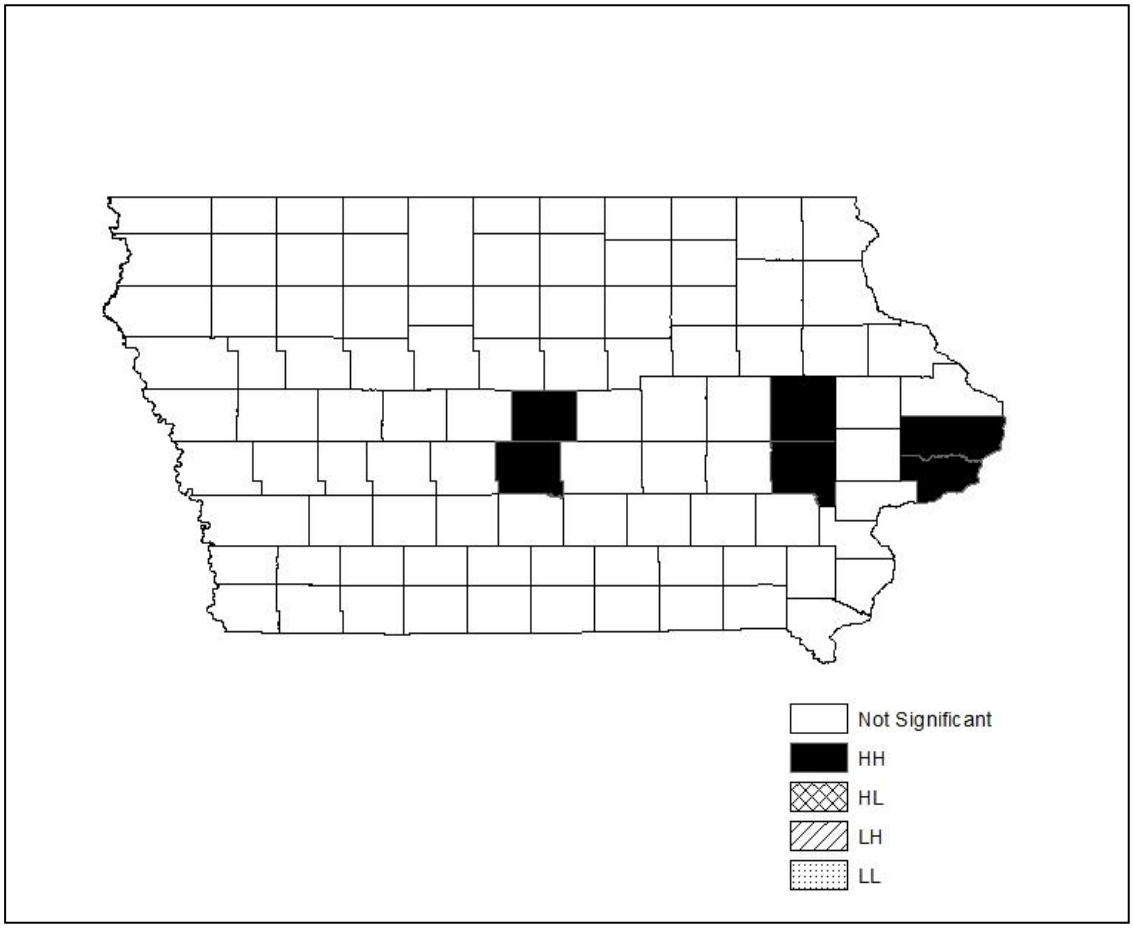


Figure 9: LISA for the Homicide Count of Iowa

Figure 10 shows the LISA of gun availability in Virginia. One high positive significant cluster is found. The cluster consists of Greensville, Sussex, Southhampton, Dinwiddle, Amelia, Powhatan, Richmond City, Charles City, Surry, Goochland, and Petersburg Counties. Additionally, Bath and Clarke counties show a high level of gun availability, whereas their surrounding counties show low values.

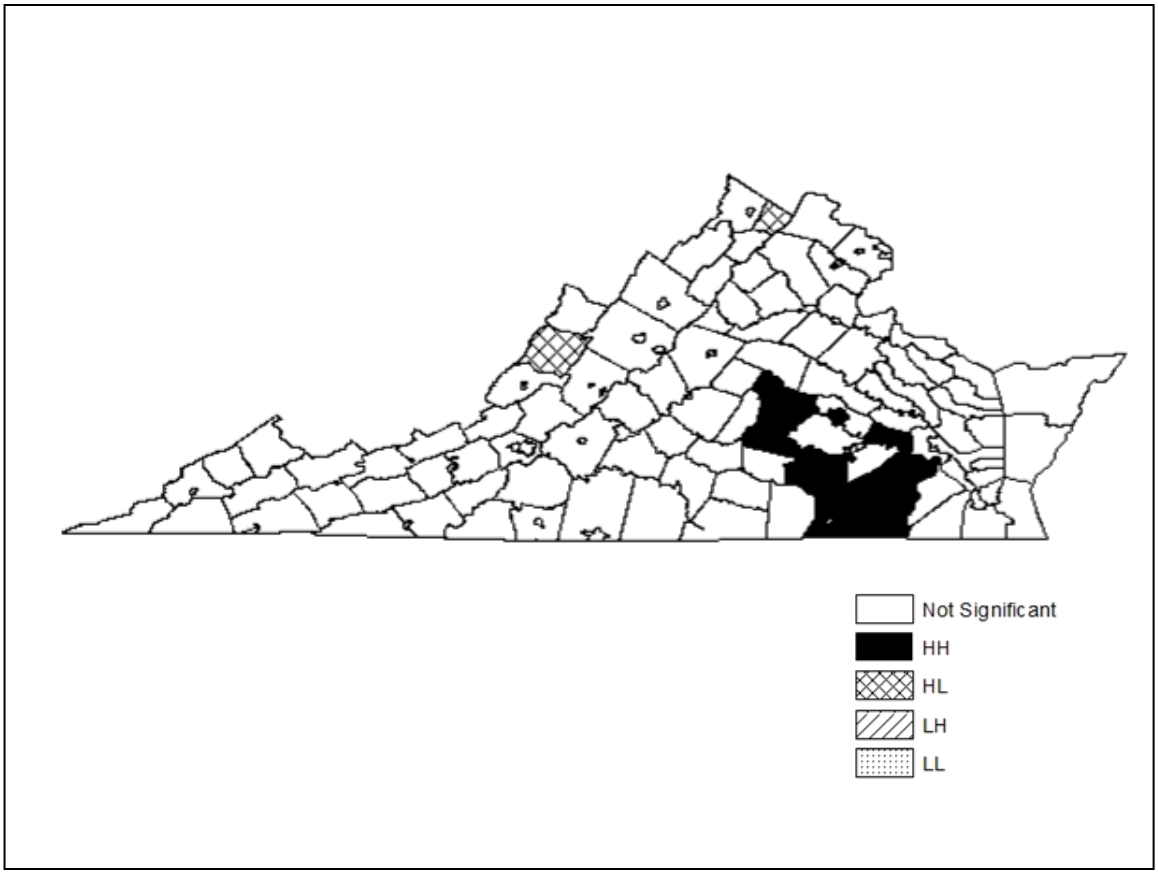


Figure 10: LISA for Gun Availability in Virginia

Lastly for spatial autocorrelation, Figure 11 displays the LISA for gun availability in Iowa. Two counties are surrounded by significantly lower values than their own. Those counties are Decatur and Butler. It should be noted that there is some level of local spatial autocorrelation before going forward in the analysis. It should be taken as a weakness as the analysis continues. I now move forward with the mediation procedures.

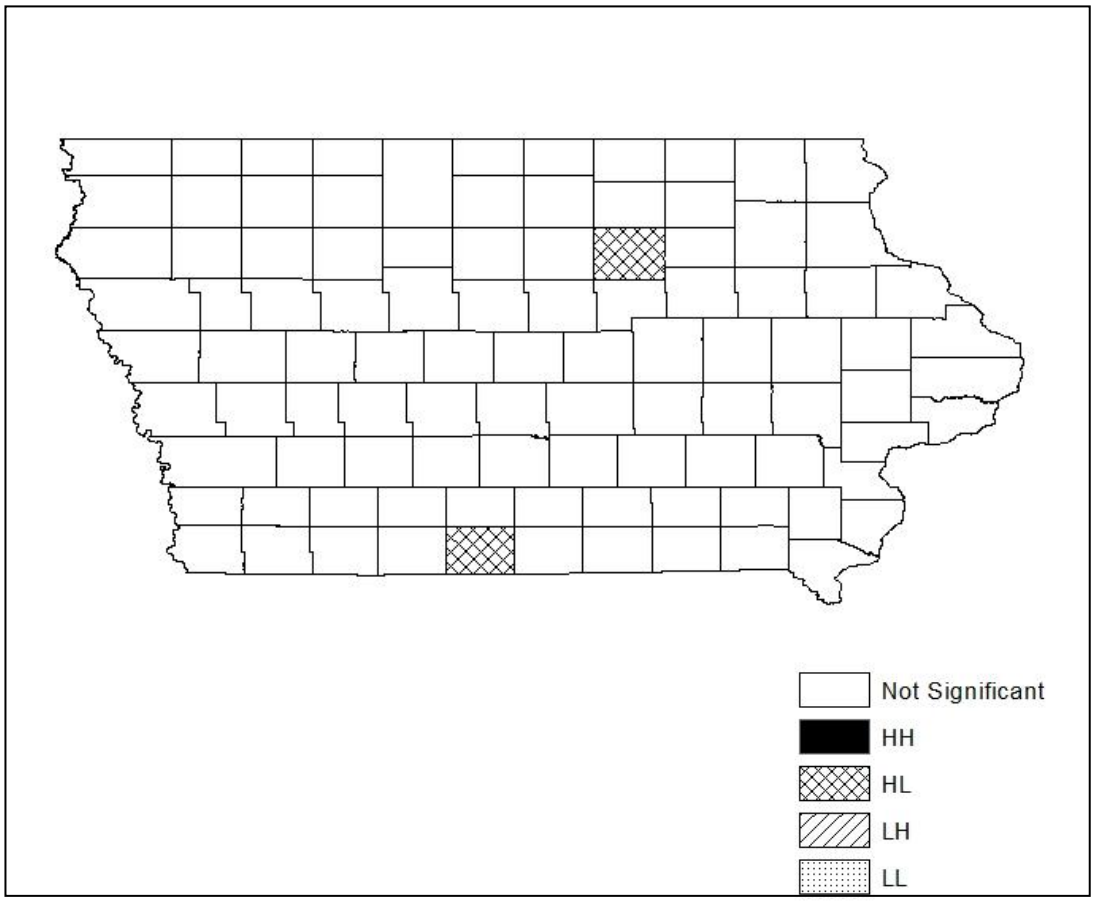


Figure 11: LISA for Gun Availability in Iowa

First Step of Mediation: Iowa and Virginia

A negative binomial regression was estimated to test the hypothesis that drug markets, which are represented by the dichotomous threshold measure, are positively related to the homicide count in Virginia and Iowa counties, controlling for the effects of the integration of social disorganization and routine activity theory, along with structural covariates of homicide (N=232). The incident rate ratio is used to ease interpretation of the coefficients. Multicollinearity was checked in the model. The highest VIFs were racial heterogeneity and residential mobility, 2.16 in each case. MSA was 1.62, the logarithm of Hispanic population was

1.99, the drug threshold was 1.38, concentrated disadvantage was 1.89, and the logarithm of the total population was 2.14.

As shown in Table 2, drug market location is found to be related to the homicide count as indicated through the incident rate ratio of 1.47 with a p-value of .047. Specifically, this shows, while controlling for theoretically relevant variables that being a drug market county increases the rate of the expected homicide count by 1.47 ($p < .05$) for each county. This supports the first hypothesis that drug markets are positively and significantly related to the homicide count at the county-level in Iowa and Virginia. More importantly, the first test of mediation has been completed successfully as the main explanatory variable (x) is significantly related with the dependent variable (y).

There were other predictors of homicide that reached significance. As discussed earlier the concentrated disadvantage scale is a combination of percent unemployment, percent of female headed households, and percent of poverty. For every one unit increase in the deprivation scale, the rate of the expected homicide count increases by 1.05 ($p<.001$). Being a county that is categorized as a MSA increases the rate of expected homicide count by 1.70 ($p < .05$). Lastly, there is a negative association between percent Hispanic and homicide in Virginia and Iowa. At the county level, with each additional unit increase in the percentage of Hispanic population the rate of the expected homicide count decreases by .64 ($p<.01$). Finally, non-significant variables include: residential mobility and racial heterogeneity. The logarithm of total population is utilized as an offset variable for the analysis (Osgood, 2000). By inclusion of an offset variable reflecting population it is possible to interpret the IRRs as changes in rates per unit of analysis in the independent variables.

Table 2: Negative Binomial Regression of Homicides of Virginia and Iowa Counties (N=232)

Homicide Count	IRR	SE	z
Explanatory variable			
Drug Market	1.47*	.29	1.98
SD/RAT Variables			
Racial Heterogeneity	1.01	.01	1.75
Concentrated Disadvantage	1.05***	.01	4.52
Residential Mobility	.98	.01	-1.08
Control Variables			
Percent Hispanic (logged)	.64**	.10	-2.74
MSA	1.70*	.38	2.34
Population (logged)	Offset		

Pseudo R^2=.1084
*p<.05; **p < .01; ***p<.001
Coefficients in Incident Rate Ratio (IRR) Format

Second Step of Mediation: Iowa and Virginia

Shown in Table 3 is the second step of mediation. For this test to be successful the explanatory variable (x) must be significant with the mediating variable (z). In this analysis the explanatory variable is drug market and the mediating variable is gun availability. An ordinary least squares regression is used since the dependent variable (gun availability) is a continuous variable. Multicollinearity was checked in the model. The highest VIF was racial heterogeneity, 2.43. MSA was 1.64, the logarithm of Hispanic population was 2.04, the drug threshold was 1.41, concentrated disadvantage was 1.86, and the logarithm of the total population was 1.63.

Drug market counties are significantly related with homicide counts at county-level in Iowa and Virginia after accounting for theoretical and control variables. Being a drug market county increases gun availability by 6.26 ($p < .05$). There are additional correlates in the model that were determined to be significant. Racial heterogeneity is found to be a strong predictor of arrestee gun availability. For every one unit increase in racial heterogeneity there is a .45 increase in arrestee gun availability ($p < .001$). A negative relationship was found between residential mobility and arrestee gun availability. As the percent of those who moved into a new unit during the previous five years increases, there is a .86 decrease in arrestee gun availability. Another negative relationship was established between the percentage of the Hispanic population per county and the arrestee gun availability. As the percentage of Hispanics increase in a county, there is a 5.45 decrease in gun availability ($p < .01$).

Table 3: OLS Regression of Gun Availability in Virginia and Iowa Counties (N=232)

Gun Availability	*b*	SE	t
Explanatory variable			
Drug Market	6.27*	2.78	2.25
SD/RAT Variables			
Racial Heterogeneity	.44***	.08	5.38
Concentrated Disadvantage	.24	.15	1.68
Residential Mobility	-.86***	.20	-4.38
Control Variables			
Percent Hispanic (logged)	-5.45**	1.74	-3.13
MSA	4.07	2.68	1.52
Population (logged)	2.26	1.31	.92

R^2:=.3125
*p<.05; **p < .01, ***p<.001

Third Step of Mediation: Iowa and Virginia

As has been discussed throughout this chapter and in the hypotheses, in a mediation test there must be a significant relationship between (x) drug markets, and (y) homicide count. This is the original model; it includes all variables with the exception of (z) gun availability. Secondly, there must be a significant relationship between both (z) gun availability and (y) drug markets. Lastly, the original model is tested with the addition of z, the hypothesized mediator. The mediator (z) must be a significant predictor of the dependent variable (y) in the same model; with its addition the relationship between (x) and (y) must decrease or disappear completely. In the previous models we see affirmation of the first two tests. The final model tests if gun availability is significantly related with homicide count and whether it acts as a mediator in the relationship between drug markets and homicide. Once again, multicollinearity was checked in the model. The highest VIF was racial heterogeneity, 2.44. Gun availability was 1.64, MSA was 1.64, the logarithm of Hispanic population was 2.05, the drug threshold was 1.41, concentrated disadvantage was 1.90, and the logarithm of the total population was 2.14.

As shown in Table 4, the analysis is a negative binomial regression of the homicide count, drug markets, and gun availability for Virginia and Iowa. For every one unit increase in gun availability ($p < .001$) the rate of the expected count of homicide increases by 1.02 ($p< .001$). Additionally, with the introduction of gun availability to the model the relationship between drug markets and homicide becomes non-significant. With this finding it is determined that in fact gun availability influences the relationship between drug markets and homicide in Virginia and Iowa. In addition to this finding, much as in model 1, other theoretical and control variables reached significance. These efficacious results demonstrate the existence of mediation. Consistent with

model 1, Table 2, concentrated disadvantage remains a significant predictor of homicide; for every incremental unit increase the rate of the expected homicide count increases by 1.04 ($p < .001$). Additionally as in model 1, Table 2, MSAs are a significant predictor of homicide, being a county that is designated as a MSA increases the rate of the expected count of homicide by 1.56 ($p < .05$). Lastly, it should be noted that interaction terms were added to the final model to determine differences between urban and rural locations. The terms were a combination of MSA with drug market and MSA with gun availability. Both terms were found to be non-significant (results not shown).

Table 4: Negative Binomial Regression of Homicide in Virginia and Iowa (N=232)

Homicide	IRR	SE	z
Explanatory variable			
Drug Market	1.23	.23	.26
Gun Availability	1.02***	.01	4.19
SD/RAT			
Racial Heterogeneity	1.00	.01	.65
Concentrated Disadvantage	1.04***	.01	4.31
Residential Mobility	.99	.01	-.79
Control Variables			
Percent Hispanic (logged)	.75	.12	-1.79
MSA	1.56*	.34	2.06
Population (logged)	offset		

Pseudo R^2=.1344
*p<.05; **p < .01, ***p<.001
Coefficients in Incident Rate Ratio (IRR) Format

The final test of mediation is a significance test. Since up to this point all previous tests have been passed, if the final significance test is affirmed mediation does exist. Using the calculation from the Sobel test website provided by Preacher and Leonardelli (2013), the mediation finding is determined to be significant as the test statistic for the Sobel test is 1.99 ($p < .05$). The hypothesis that gun availability mediates the relationship between drug markets and homicide is confirmed. Figures 12 and 13 describe the mediation relationship.

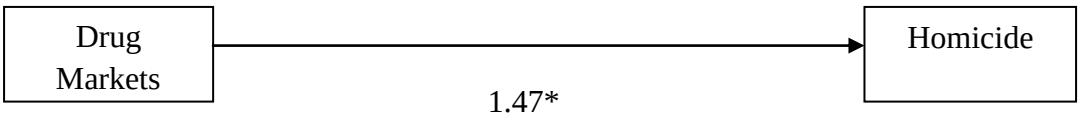


Figure 12: Drug Market to Homicide

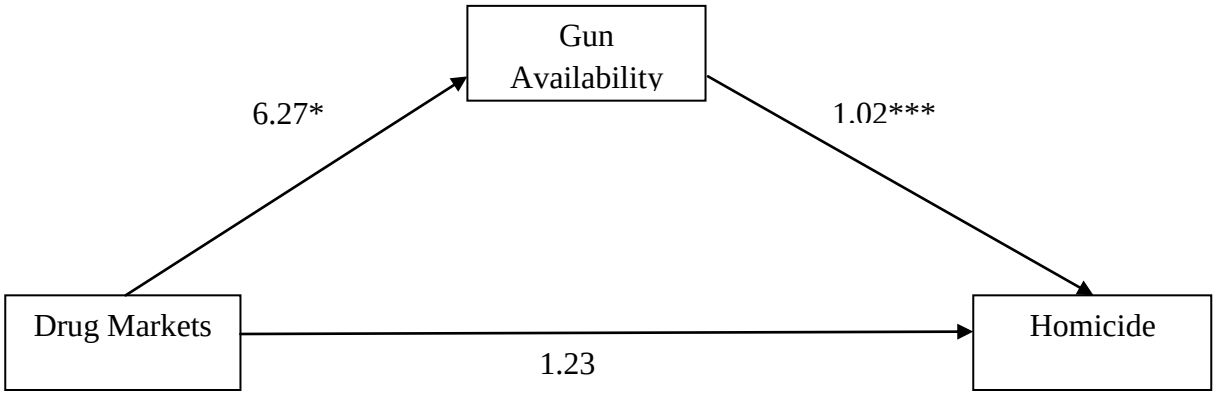


Figure 13: Drug Market to Gun Availability to Homicide

Preliminary Analysis: Iowa

As mentioned earlier the purpose of including Virginia and Iowa in this analysis is due to their different makeup. Regionally, economically and demographically, these states offer a wide range of differences. As we have seen, together the counties in the two states have confirmed the hypothesis that gun availability mediates the relationship between drug markets and homicides. I now determine whether similar results are observed in the examination of these states independently. Determining the differences in the states will assist in understanding how explanatory variables, theoretical variables, and structural correlates differ by state. Additionally, exploring differences between the states either helps to support consistency of the findings or

brings forth an opportunity to uncover other exogenous factors that have an influence on the relationships used in this study.

Table 5 displays descriptive statistics for Iowa (N=99). The homicide count has a mean of .54. Similar to the dependent variables it is negatively sloped and its standard deviation (SD=1.33) is larger than its mean. A total of 75.76% of the sample had zero homicides for 2010 (N=75). Since the zero count is high a Vuong test was computed to determine whether a zero inflated negative binomial or a standard negative binomial is preferred (1989). If the test were significant the preferred test is a zero inflated negative binomial model. The outcome for the current study leads to a standard negative binomial regression (Pr>z= .086). For these reasons negative binomial regression is chosen to be the most suitable equation for analytical purposes (Osgood, 2000).

Since the main explanatory variable is drug market, due to its dichotomy it is given in the proportion of N. A total of 24% of the counties are designated as drug markets for Iowa. As shown in Figures 14 and 15, through the observation of the spline and scatter plot 400 arrests per 100,000 is the drug market threshold of Iowa.

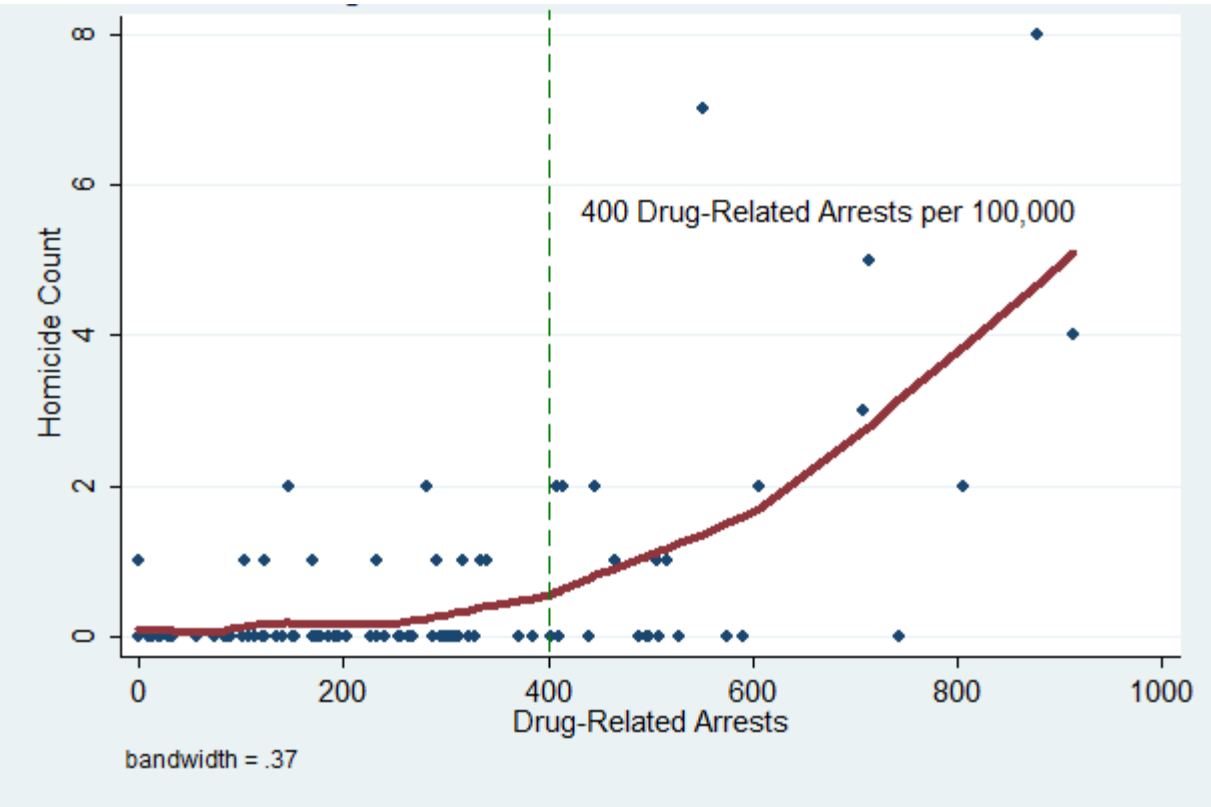


Figure 14: Smoothing Spline determined through the goodness of fit with LOWESS Regression.

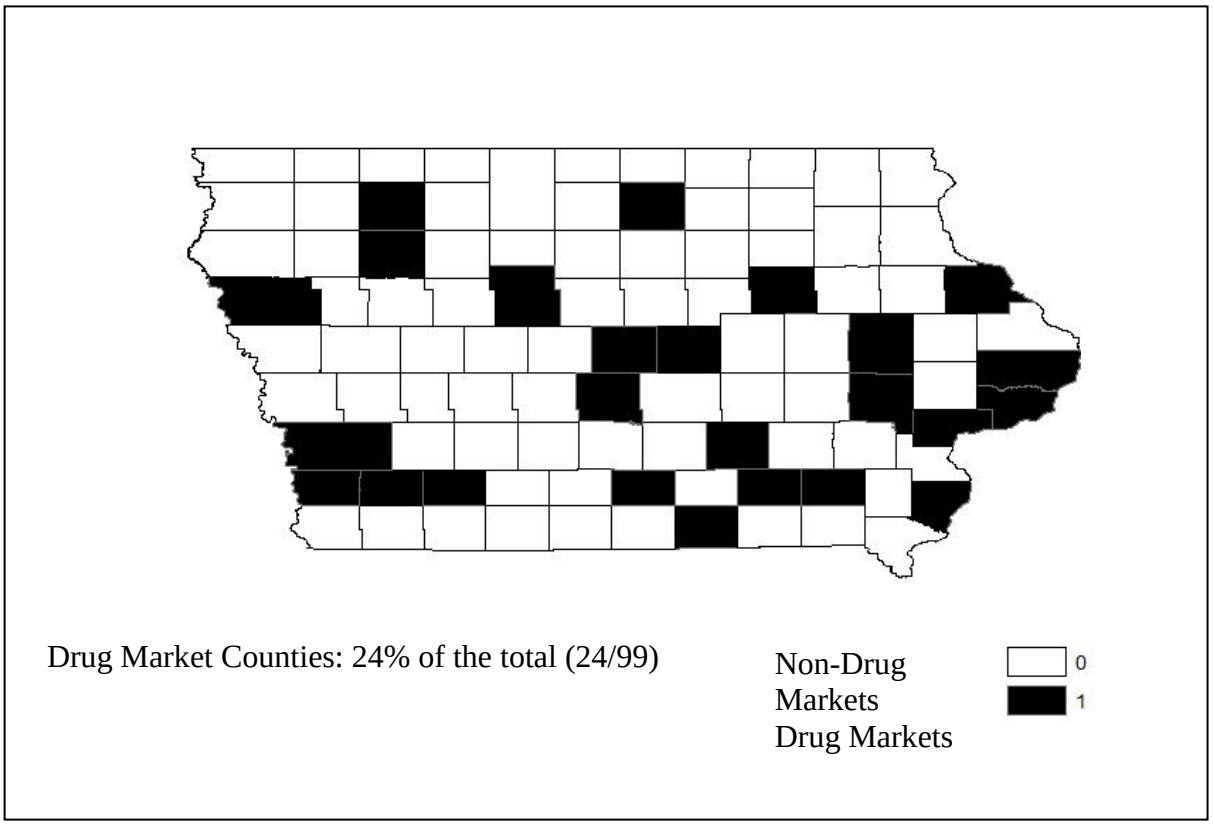


Figure 15: Drug-Related Arrest Threshold for Iowa Analysis

Once again the proposed mediation variable is gun availability. Its mean is 12.26 on a percentage scale of 0 to 100. For Iowa, gun availability is positively skewed. For this reason the logarithm is taken for the variable. The theoretical variable racial heterogeneity has a mean of 9.28 on a percent scale of 0 to 100. The second theoretical variable is concentrated disadvantage; its mean is 16.65 with a range from 5.89 to 28.99. The final theoretical variable is residential mobility, which has a mean of 27.95; it ranges from 17.10 to 49.40.

Furthermore, as MSA is a dichotomy it is observed as the proportion of N. A total of 20% of the counties qualify as MSAs. The average percentage of Hispanics in a county for Iowa is 3.84. As in the previous section percent Hispanic is positively skewed. The variable is transformed into its logarithm for analysis. Lastly, the average total population for an Iowan

county is 30,771.26 with a range from 4,029 to 430,640. The variable is also positively skewed so the logarithm is taken for analytical purposes.

Table 5: Descriptive Statistics for Iowa Counties (N=99)

Variable	*Mean*	*SD*	*Minimum*	*Maximum*
Dependent Variable				
Homicide	.54	1.33	0	8
Explanatory variable				
Drug-Market	.24	.43	0	1
Gun Availability	12.26	15.31	0	100
SD/RAT				
Racial Heterogeneity	9.28	7.22	2.77	33.76
Concentrated Disadvantage	16.65	5.12	5.89	28.99
Residential Mobility	27.95	5.31	17.10	49.40
Control Variables				
Percent Hispanic	3.84	4.42	.60	24.20
MSA	.20	.40	0	1
Total Population	30,771.26	52,888.73	4,029	430,640

First Step of Mediation: Iowa

Similarly to the previous section, a negative binomial regression is estimated to test the hypothesis that drug market counties are positively related to the homicide count, while controlling for theoretical and structural covariates of homicide. As in the previous models multicollinearity is tested. The highest VIF was racial heterogeneity, at 4.99., MSA was 1.73, the logarithm of Hispanic population was 3.01, the drug threshold was 2.16, concentrated disadvantage was 1.85, residential mobility was 2.41, and the logarithm of the total population was 3.58. The notable difference is that this version of analysis excludes Virginia as only Iowa counties are observed. It is found that being a drug market county increases the rate of the expected count of homicide by 3.44 ($p < .05$). As Table 6 shows, drug market is the only significant predictor of homicide for Iowa counties. Racial heterogeneity is found to have a high level of multicollinearity in the model. Although this is the case the removal of the variable from the model does not significantly increase any of the z-scores for other variables in the model. This leads to a limitation in the model and these analyses as the sample size of Iowa Counties (N=99) may not offer enough power or variance for the analysis of this state alone.[14] Although this is the case, as drug markets are a significant predictor of homicide the mediation test continues.

[14] To determine if the number of units may be having an impact a regression was estimated where state was dummy coded within a model with all other variables present. The state indicator was insignificant, statistically demonstrating that the effect of low number of units may be impacting the results as the parameter estimates of the model are not significantly effected by the location of counties in one or the other states.

Table 6: Negative Binomial Regression of Homicides in Iowa Counties (N=99)

Homicide Count	IRR	SE	z
Explanatory variable			
Drug Market	3.44*	1.77	2.41
SD/RAT Variables			
Racial Heterogeneity	1.03	.04	.89
Concentrated disadvantage	1.01	.04	.29
Residential Mobility	.94	.04	-1.63
Control Variables			
Percent Hispanic (logged)	.55	.18	-1.86
MSA	1.17	.50	.37
Population (logged)	Offset		

Pseudo R^2=.0821
*p<.05; **p < .01, ***p<.001
Coefficients in Incident Rate Ratio (IRR) Format

Second Step of Mediation: Iowa

Multicollinearity was first tested as in all models. The highest VIF was racial heterogeneity, 4.84, MSA was 1.73, the logarithm of Hispanic population was 2.91, the drug threshold was 2.13, concentrated disadvantage was 1.86, residential mobility was 2.42, and the logarithm of the total population was 3.19. Shown in Table 7 is the second step of mediation. It should be noted first that the model fails to reach significance. Additionally, there are no significant predictors in the model of gun availability in Iowa. This suggests that in Iowan counties consistent reliable predictors of violent crime are not significant correlates of gun availability. Although, a caveat should be offered here as I remind the reader that the number of units of analysis for this section are relatively low (N=99).

Table 7: OLS Regression of Gun Availability and Drug Markets in Iowa Counties (N=99)

Gun Availability (logged)	*B*	SE	t
Explanatory variable			
Drug Market	.47	.39	1.20
SD/RAT Variables			
Racial Heterogeneity	-.00	.04	-.06
Concentrated disadvantage	.02	.03	.65
Residential Mobility	-.05	.03	-1.34
Control Variables			
Percent Hispanic (logged)	.02	.24	-.09
MSA	.25	.38	.67
Population (logged)	.25	.24	1.02

R^2=.0834
*p<.05; **p < .01, ***p<.001

Third Step of Mediation: Iowa

As shown in Table 7, the mediation test for Iowa failed. Although this is the case, I continue to test the impact gun availability has on the homicide count while controlling for drug markets. I do this to gain better understanding of the influence drug markets and gun availability has on homicide in Iowa counties. Once again, multicollinearity is checked for the model. The highest VIF was racial heterogeneity, 5.00, gun availability was 1.10, MSA was 1.74, the logarithm of Hispanic population was 3.03, the drug threshold was 2.19, concentrated disadvantage was 1.86, residential mobility was 2.43, and the logarithm of the total population was 3.64.

In Table 8, the negative binomial regression of the homicide count in Iowa, unlike the previous model, is significant. Both of the explanatory variables are significant in the model. For every one unit increase in gun availability there is an increase in the rate of the expected homicide count by 2.19 ($p < .01$). Additionally, as in the first model in the Iowa section of analysis, drug market remains a significant predictor of homicide. Having a drug market increases the rate of the expected count of homicide by 3.23 ($p<.05$). It should be noted that the drug market z-score decreased with the introduction of gun availability into the model from 2.41 to 2.36. There were no other variables found to be significant in the model. As in the previous section, interaction effects were tested, which were the products of MSA with drug market and MSA with gun availability. The terms were non-significant (results not shown). Lastly, as mediation testing failed for Iowa, I now move forward in my analysis of Virginia.

Table 8: Negative Binomial Regression of Homicide in Iowa (N=99)

Homicide	IRR	SE	z
Explanatory variable			
Drug Market	3.23*	1.61	2.36
Gun Availability (logged)	2.19**	.56	3.09
SD/RAT			
Racial Heterogeneity	1.01	.04	.20
Concentrated disadvantage	.99	.04	-.26
Residential Mobility	.99	.04	-.32
Control Variables			
Percent Hispanic (logged)	.68	.23	-1.15
MSA	.76	.35	-.59
Population (logged)	offset		

Pseudo R^2=.1519
*p<.05; **p < .01, ***p<.001
Coefficients in Incident Rate Ratio (IRR) Format

Preliminary Analysis: Virginia

Table 9 shows the descriptive statistics for Virginia (N=133). Virginia averaged approximately 3.23 homicides per county in 2010. A total of 44.36% of the sample had zero homicides for 2010 (N=59). As in the two preceding sections the dependent variable, homicide count, calls for negative binomial regression as it is a negatively sloped distribution and its standard deviation (SD=7.03) is larger than its mean (Osgood, 2000).

Drug market is the main explanatory variable and is dichotomous. A total of 28% of Virginia counties contain drug markets. As shown in Figure 16, determining a cut-point by observing the LOWESS regression spline called for additional evaluation. Drug-related arrests' original metric was taken in its squared and cubed form to distinguish a threshold point. Four possible points were considered,[15] and it was finally determined that 750 arrests per 100,000 was the best observed option.

[15] Specifically, four points were considered. It was estimated that 300, 500, 750, and 950 arrests per 100,000 were the best observed options. Using the transformed, squared and cubed metric it was determined that the statistic that provided the most definitive threshold was 750 arrests per 100,000. It should also be noted that all thresholds considered do not reach significance in the first and third models.

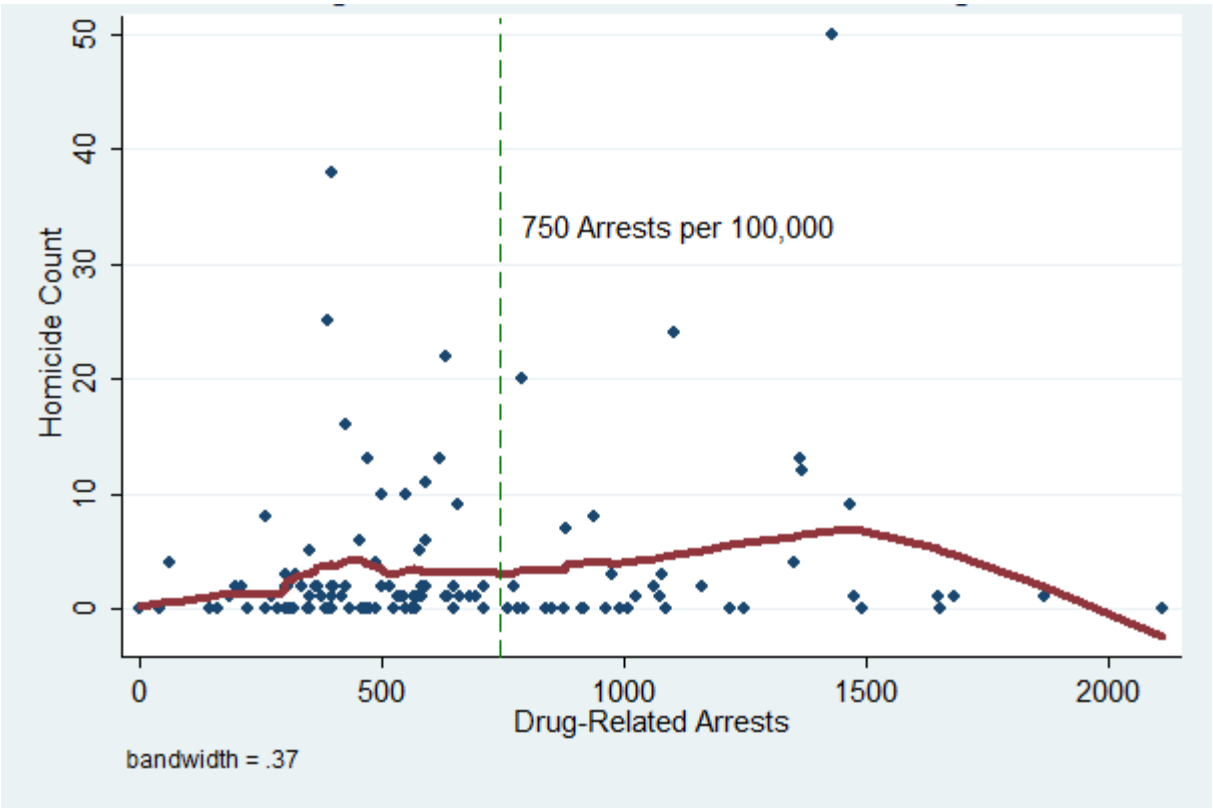


Figure 16: Drug-Related Arrests Threshold for Virgnia

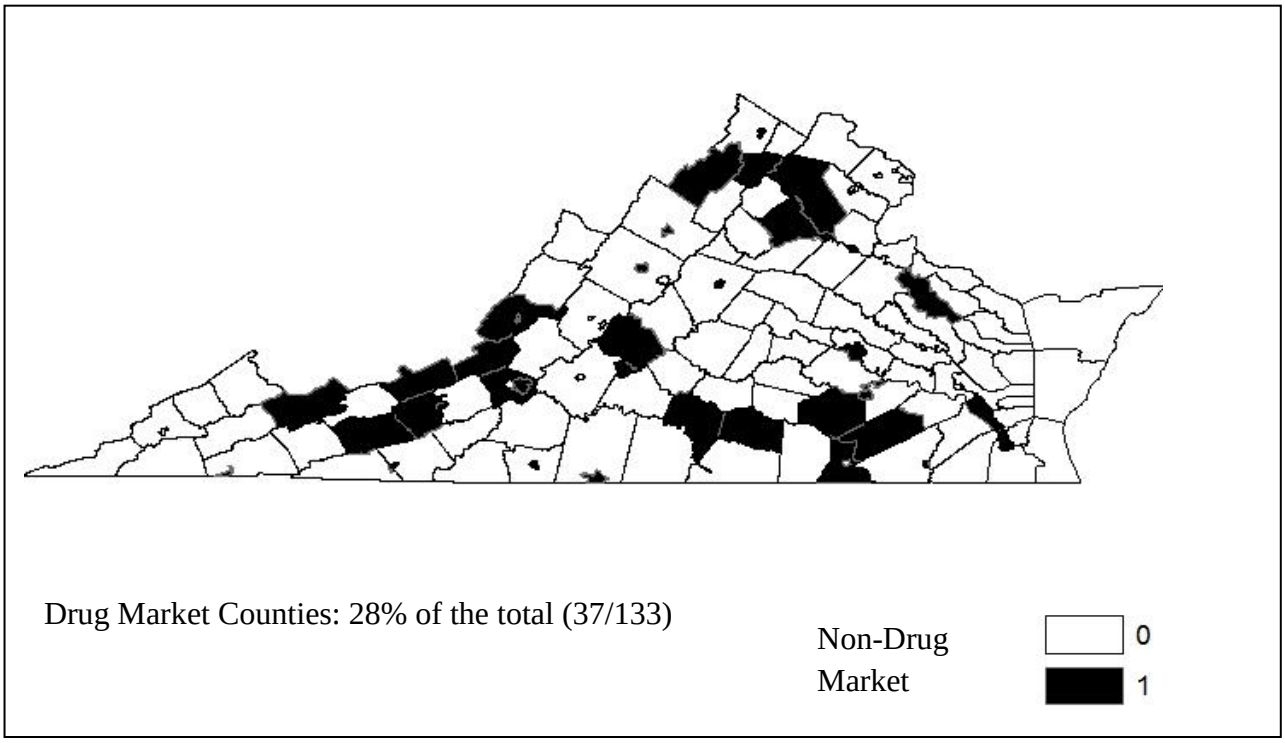


Figure 17: Drug-Related Arrest Threshold for Virginia

Gun availability is the second explanatory variable and the hypothesized mediating variable, its mean is 31.04 percent per county. Its logarithm value is not observed in this section as its skewness value does not call for a transformation to be made.

The following are theoretical and structural correlates of homicide. The mean for racial heterogeneity is 34.22 on a percent scale of 0 to 100. The range for Virginia is 3.38 to 63.65. The mean score is 21.49 with a range from 5.89 to 56.29. The average residential mobility per county is 29.59, with a range of 9.20 to 54.00. The dichotomous variable, MSA, is expressed as a proportion of N. A total of 66% of the counties in Virginia are in MSAs. The ethnicity measure percent Hispanic has a mean of 4.48 per county; as in the previous section its skewness value is high for Virginia counties. Thus the logarithm is taken to prepare for analyses. The final variable

is the total population; its mean is 60,128.32 with a range from 2,321 to 1,081,726. Its skewness value remains high; since this is the case the variable is transformed into its logarithm.

Table 9: Descriptive Statistics of Virginia Counties (N=133)

Variable	*Mean*	*SD*	*Minimum*	*Maximum*
Dependent Variable				
Homicide	3.23	7.03	0	50
Explanatory variable				
Drug-Market	.28	.45	0	1
Gun Availability	31.04	18	0	97.56
SD/RAT				
Racial Heterogeneity	34.22	17.43	3.38	63.65
Concentrated disadvantage	25.09	10.85	7.79	56.29
Residential Mobility	29.59	9.31	9.20	54
Control Variables				
Percent Hispanic	4.48	5.11	.40	32.5
MSA	.66	.47	0	1
Total Population	60,128.32	116,936.20	2,321	1,081,726

First Step of Mediation: Virginia

As in the previous sections, a negative binomial regression is estimated. As for all models, multicollinearity is tested. The highest VIF was residential mobility, 3.03, MSA was 1.40, the logarithm of Hispanic population was 2.73, the drug threshold was 1.31, concentrated disadvantage was 1.85, racial heterogeneity was 1.74, and the logarithm of the total population was 2.21. Unlike previous sections, as shown in Table 10 the dichotomous measure of drug markets fails to be a significant predictor of homicide. Due to this result, the mediation test fails for Virginia. I continue with the interpretation of the current model and proceeding models to test the other structural correlates of homicide and gun availability.

For every one unit increase in concentrated disadvantage, the rate of the expected count of homicide increases 1.05 ($p < .001$). This finding is consistent with a substantial literature in criminology showing that poverty significantly and positively influences violent crime. Additionally, there is a negative relationship between percent Hispanic and homicide in Virginian counties. For each additional unit increase in the percentage of Hispanic population the rate of the expected count of homicide decreases by .60 ($p < .05$). Much like the Iowan models there are fewer significant correlates of homicide. Due to this consistency, at some level statistical power is affecting analysis.

Table 10: Negative Binomial Regression of Homicides in Virginia (N=133)

Homicide Count	IRR	SE	z
Explanatory variable			
Drug Market	.82	.21	-.78
SD/RAT Variables			
Racial Heterogeneity	1.00	.01	.36
Concentrated disadvantage	1.05***	.01	4.32
Residential Mobility	1.01	.02	.38
Control Variables			
Percent Hispanic (logged)	.60*	.12	-2.51
MSA	1.64	.46	1.80
Population (logged)	Offset		

Pseudo R^2=.0853
*p<.05; **p < .01, ***p<.001
Coefficients in Incident Rate Ratio (IRR) Format

Second Step of Mediation: Virginia

Shown in Table 11 is the OLS regression of drug markets on gun availability. The highest VIF was residential mobility, 3.22. The gun availability VIF was 1.30, MSA was 1.41, the logarithm of Hispanic population was 2.78, the drug threshold was 1.35, concentrated disadvantage was 1.77, racial heterogeneity was 1.89, and the logarithm of the total population was 1.50. Consistent with the hypothesis, drug markets are significantly and positively related with the homicide count at the county level in Virginia after accounting for theoretical and control variables. Drug market counties are significantly related with gun availability ($b=7.40$, $p< .05$). Additionally, racial heterogeneity is found to be positively associated with gun availability. For every one unit increase in racial heterogeneity there is a .36 increase in gun availability ($p. < .001$). Furthermore, a negative relationship was found between residential mobility and gun availability. As the percent of those who moved into a new unit increases, there is a .75 decrease in arrestee gun availability. The measure of ethnicity is negatively associated with gun availability. As the percentage of Hispanics increase by 1 unit the availability of firearms decrease by 6.41 ($p < .01$). Lastly, for every one unit increase in population there is a 3.42 increase in gun availability. More specifically, as the number of people who reside in a county increase so does the availability of firearms.

Table 11: OLS Regression of Gun Availability in Virginia Counties (N=133)

Gun Availability	*b*	SE	t
Explanatory variable			
Drug Market	7.40*	3.56	2.08
SD/RAT Variables			
Racial Heterogeneity	.36***	.11	3.34
Concentrated Disadvantage	.16	.17	.92
Residential Mobility	-.75**	.26	-2.86
Control Variables			
Percent Hispanic (logged)	-6.41**	2.70	-2.38
MSA	3.15	3.52	.90
Population (logged)	3.42*	1.57	2.17

R^2=.2310
*p<.05; **p < .01, ***p<.001

Third Step of Mediation: Virginia

A negative binomial regression is estimated for Virginia, as the dependent variable is the homicide count. The highest VIF was residential mobility, 3.28, MSA was 1.41, gun availability is 1.48, the logarithm of Hispanic population was 2.80, the drug threshold was 1.35, concentrated disadvantage was 1.85, racial heterogeneity was 1.90, and the logarithm of the total population was 2.22. Gun availability is positively associated with homicide in the model ($p < .001$); for every one unit increase, the rate of the expected count of homicide increases by 1.02 ($p< .001$). The other main explanatory variable, drug markets, fails to reach significance. Additionally, concentrated disadvantage is positively related with homicide. For every one unit increase in the concentrated disadvantage the expected count of homicide increases by 1.05 ($p< .001$). As in the previous models urban and rural differences were tested with both explanatory variables. The terms were non-significant (results not reported).

Table 12: Negative Binomial Regression of Homicide in Virginia (N=133)

Homicide	IRR	SE	z
Explanatory variable			
Drug Market	.70	.17	-1.45
Gun Availability	1.02***	.01	3.33
SD/RAT			
Racial Heterogeneity	1.00	.01	-.46
Concentrated disadvantage	1.05***	.01	4.41
Residential Mobility	1.01	.02	.39
Control Variables			
Percent Hispanic (logged)	.69	.14	-1.87
MSA	1.61	.42	1.83
Population (logged)	offset		

Pseudo R^2 =.1078
*p<.05; **p < .01, ***p<.001
Coefficients in Incident Rate Ratio (IRR) Format

CHAPTER SIX: DISCUSSION

The current study was concerned with the impact firearm availability has on the relationship between drug markets and homicide. The first mediation analysis, which benefitted from the largest sample size, demonstrated strong support for the hypothesis. As posited, gun availability mediated the relationship between drug markets and homicide. This finding supports the work of previous scholars as a relationship is found between these variables (Blumstein, 1995). First, using both Virginia and Iowa, it was found that drug markets are positively related to homicide for 2010. This advances the argument that drug market counties are in fact more inclined to be violent zones; this is largely due to *systemic violence* (Goldstein, 1985; Resignato, 2000; Reuter, 2009; Corsaro et al., 2012). Additionally, support is found for the argument that gun availability is increased in drug market counties. As suggested, this is explained by the notion that those who work in the drug market who carry illegal drugs and money are more likely to arm themselves as they begin to see themselves as targets of crime. Furthermore, Blumstein proposes that this starts an escalation effect as those in the community will see armed drug dealers walking the neighborhood and thus arm themselves as well (Blumstein, 1995; Blumstein & Cork., 1996).

Most importantly to this analysis, once gun availability is introduced to the model, the variable drug market fails to reach significance in its relation to homicide. This suggests the lethality of drug markets is very much impacted by gun availability, especially firearms, in the hands of individuals who are criminally involved. A drug market thus may facilitate violent altercations even when firearms are not present but their influence is not significant once gun availability is controlled.

It is important to take from this that there are various factors impacting the homicide counts even in violent drug markets. Drawing upon theory, firearms add an increased lethal component to the relationship between motivated offenders, suitable targets, and guardianship (Cohen & Felson, 1979). Those who participate in drug markets are more likely to carry firearms (Felson & Bonkiewicz, 2011); additionally, a firearm may even enhance the likelihood an offense will occur as those who are more likely to carry a firearm are more likely to have been in a violent altercation than those who do not carry (Vaughn et al., 2012). Support for this argument is found in the analysis of Virginia and Iowa combined as drug markets become more lethal with increases in firearm availability.

Once the states were analyzed separately, much of the statistical power decreased as did the sample. Although this is the case, significant relationships were still found. For Iowa, in the first step of mediation drug markets are significant with homicide. This was consistent with the hypothesis and the basis of the study. Drug markets are violent locations that with the increase of firearms become more lethal. This relationship exists despite the sample size (N=99). Interestingly, gun availability was not related to drug markets in Iowa at the county-level. It is important to understand the original metric to better understand this non-significant relationship. In the analysis reported above drug market counties were not related to gun availability. This means in drug market counties in Iowa there are not significantly more or less of these types of offenses than in non-drug market counties after controlling for theoretical and structural variables. The final step of mediation shows that both drug markets and gun availability are related to homicide counts. This advances the argument that both gun availability and drug market locations are in fact related to homicide, which is the overall premise of the current study.

Interestingly, no other variable, structural or theoretical, reached significance in the final Iowa (see Table 8) model, demonstrating the strength of the explanatory variables.

For Virginia, in the first model drug markets were not found to be a significant predictor with homicides. Although this was the case, in the second test of mediation drug markets were found to be positively related to gun availability. This means in Virginia drug market counties there is a higher level of firearm availability than in non-drug markets. This finding is consistent with previous criminological arguments (Blumstein, 1985). It also gives more support for the gun availability measure in this analysis as it demonstrates that the percent of crimes where a firearm was used or found by authorities is not an approximate measure of homicide. A significant relationship between drug markets and homicide was not found, but one was found for drug markets and gun availability. In the final model for Virginia, gun availability is found to be a strong predictor of homicide. These relationships provide partial support for the hypotheses as drug markets and gun availability were both found to be related to homicide, but a mediation was not present. Drug markets remain a non-significant predictor for homicide. As shown, the smoothed spline graph for Virginia drug markets in Figure 12 (see Chapter 5), stayed relatively constant when it came to the relationship between the dependent variable and the original drug-arrest metric. Although there was one outlier, taken in whole, the counties did not differ too much in regard to the relationship between drug-related arrests and homicide. This demonstrates a decreased level of variability in the state of Virginia. It should be noted here, with the state of Iowa included, thus increasing the cases, it was easier to identify a threshold. A higher number of cases may refine the number, breaking point, of drug-arrests where a county becomes a drug

market. Yet, for future analysis this should either be explored through including more states or increasing the time-span that is studied.

For all three analyses, moderation tests were utilized for urban and rural drug markets and gun availability. To test whether urban drug markets differ from rural drug markets in regards to the gun availability mediation with homicide, interaction terms were created (results not shown). The urban and drug market variables were joined in the creation of the interaction term for MSA and drug market were entered into the final regressions for preliminary testing. The terms were not significant. Since this is the case, currently it must be stated that there is no significant difference in urban and rural drug markets in the mediated relationship with gun availability and homicide. This was the same for gun availability, as it did not show differential effects based on urban and rural locations. I address this further in the future research section.

It should be offered here that other structural variables were included in the analyses. The variable with the highest level of consistency was percent Hispanic. The percentage of the Hispanic population was negatively related to homicide. This provides no support for public perception that locations with a higher percent of Hispanics will be more violent. It should be noted that the addition of other regions may add variation to these findings. Additionally, the variable MSA was found to be a significant predictor in the first model of homicide that included both Virginia and Iowa, yet it failed to reach significance in later models. This may be due to the decreased number of counties in these analyses and the low variability of the dichotomous measure.

The analysis of the aggregated data for Virginia and Iowa was found to be supportive of the hypothesis that gun availability mediates the relationship between drug markets and homicide. Although this study takes a snapshot in time, specifically 2010, like any market or industry one should see drug markets as not constant but fluid. Markets expand, contract, and compete. An increase in violence can be based on the disorganization of a neighborhood and/or the organization of the drug market. Once again, social disorganization is not a dyadic formulation; it is fluid. When communities become more socially disorganized, illegal networks are allowed to take root. In other words, there is a range of contextual locations. That being said, there is a tipping point where the level of social disorganization facilitates the development of an illegal drug market more than in socially organized communities. With the institution of an illegal drug market there are significantly more motivated offenders and targets.

There are, of course, other factors and causes leading to violent crime in drug markets, one example would be competition. Other drug organizations may move in and compete for customers, which could disorganize and destabilize the current drug market, increasing motivated offenders and suitable targets. For instance the stabilization of drug markets in some cities since the 1980s has decreased the violence and lethality of these areas (Wintemute, 2000). Importantly, in periods of destabilization, firearms may be more prevalent as an escalation effect may take place regardless of the contributing factor (Blumstein, 1995).

Theoretical Implications

Again, this study is not a test of the integrated theory. Although this is the case, there was partial support for the some of its tenets. A variable that resonated in many of the models was

concentrated disadvantage. The index consisted of three of the theoretical appropriate measures (female-headed households, poverty, and unemployment). The measure showed the strongest positive relationship when regressed against homicide. Interestingly, when regressed against gun availability the measure did not reach significance. Understandably, firearms are available for use in crime in both socially deprived areas and locations of affluence.

Another theoretical approximate measure, racial heterogeneity, acted oppositely. When regressed against homicide, racial heterogeneity did not show strong predictive power. Yet, when regressed with gun availability racial heterogeneity showed a strong positive relationship. Specifically, counties with increased racial diversity have more firearms. Additionally, heterogeneity was the proxy measure of network communication and guardianship. Theoretically, an increase in racial heterogeneity would symbolize a decrease in network communication and guardianship. Since this is the case, while considering these are approximate measures, the weaker the network communication and the less capable the guardianship, the higher the measure of gun availability.

The third theoretical variable is residential mobility, which represented collective efficacy. The variable reached significance in models predicting gun availability. This suggests as residential mobility increases gun availability decreases. More specifically, as the percent of those who have recently moved into a county increase gun availability decreases. As flux in the community increases the percent of those offenses where a firearm was involved or found decrease. Residential mobility was not found to be a significant predictor in any of the models predicting homicide counts. For this reason I find partial support for the integrated theory.

Policy Implications

The creation of a measure that uses statistics to determine drug market location could assist in creating more consistent guidelines for assignment of counties to a HIDTA. As mentioned in Chapter 4, HIDTA qualification is based on the decisions of government officials. Although, in some cases data may have been utilized to make this designation, the procedure leans on subjective inference as there are no statistical qualifications for the designation. A designation procedure, such as the one used in this study, can assist in making statistical assessments of which counties may benefit the most by the introduction of HIDTA zones. Additionally, such a scientific-based system can track progress of zones that are currently receiving funds in the hopes of gaining insight as to what types of programs and appropriations are needed in the future.

In the larger sample it was found that firearms provide a pathway from drug markets to homicide. A measure of gun availability was created that took into account police contact with the firearm. Much of the public discourse has been based on limiting certain types of firearms to all civilian users. The current study finds support for accountability of the user. Much like any other weapon a firearm is a tool that can be used for various interests, legal and illegal. Restrictions should be based on the background user, rather than a wide-scope policy. Background checks may provide assistance in limiting firearms or making it more difficult for certain crime involved individuals to obtain a firearm. The point that is intrinsic to this study is the context of gun availability. Having a better understanding of who is likely to commit a lethal

assault is more important than understanding what type of firearm they are likely to use during the event.

Limitations

The scope of this study was limited to two states that are fully NIBRS compliant. In a larger analysis, where states would not have to be compared, there could be more counties included from other fully compliant NIBRS states. Additionally, the study only includes one year of crimes thus decreasing the variability of the analysis.

The gun availability measure used in this study only measures those instances that are recorded by officers of the law. The total availability of firearms remains unknown, as some type of crime must be known to be committed before a firearm is recorded. Although this is imprecise like other measures, by necessity it takes into account what we know about officially reported crimes.

Although the census tract of block group level are called for theoretically due to data limitations county level data were used. Micro-level and neighborhood level theories were thus applied to county level data. A lower level of analysis is called for theoretically, however, due to data limitations, county-level data were used. Micro-level and neighborhood-level theories had to be applied to county-level data. Therefore, at most the current study is informed by the theoretical framework.

Although the creation of the new drug market measure may be the first step toward refining our understanding of those locations that are drug markets, it is still a first step. There

may be other statistical methods for the development of a more refined measure but for the purposes of this study this measure is appropriate.

No urban and rural differences were found in the models. The use of interactions provides a beginning to this investigation. As it comes to finding differences in gun availability and drug markets using a dichotomous measure of urbanity reduces variance. Coefficient comparison between an urban and rural model would have been another alternative route to determine the difference between these locations in deciphering the relationships between drug markets, gun availability, and homicide. The low number of counties and cases of homicides limited validity of this method. Expanding the time-span and regions of this analysis would allow for such an analysis to take place.

Future Research

Urban/rural differences were not found through interaction effects with drug markets. Although, there are not any homicide differences differences, this does not speak to other contextual differences which may exist between rural and urban drug markets. Such differences may be determined through qualitative research, where themes and constructs are uncovered to assist in the creation of suitable quantitative measures. Additionally, different measures of urbanity could be used to determine differences in the relationship between gun availability, drug markets, and homicide. For instance, measures such as percent urban and population density may provide a stronger measure of urbanity. Additionally, multinomial categories of urbanity could be created to allow for further variance in interaction terms. Also as discussed in the above section coefficient comparison may be a future path of determining if differences exist.

Additionally, an analysis using HIDTA designated counties can be conducted to compare the current system to these findings and the drug market measure used in this study. An argument for or against the current procedure of HIDTA designation can be fostered here as such findings are closely tied to public policy and appropriation procedures.

Further studies include utilizing incident-level data to determine differences in lethality by firearm type. Furthermore, future studies may determine if there is a type of firearm and/or type of drug market that corresponds to a type of homicide. For instance, a shotgun may be used more for domestic offenses and a handgun could be in drug market. Additionally, understanding if lethality is impacted by the type of firearm used may also provide more detail in understanding these relationships.

Lastly, much more should be done using the capabilities of NIBRS in regards to these variables. We should begin to better understand the relationships between these types of crimes based on the research made possible by incident-level databases. Knowing how a variable such as gun availability impacts another variable such as drug markets influences the direction and significance of the relationship. This should be the future direction of criminological studies as we should begin to understand that the measurement of these concepts is related in complex ways that vary across different contexts.

This study provides a statistical foundation for the relationship between gun availability, drug markets, and homicide and develops two new measures to do so. It should be noted that this study offers the first statistical test of gun availability, drug markets, and homicide. These concepts have previously been explored theoretically, yet without the statistical analyses the current study offers. Additionally, this study develops two new measures for popular concepts in

the area of criminology. Gun availability and drug markets measures in this study provide an extension and expansion of previous measures to test relationships that had primarily been discussed theoretically.

LIST OF REFERENCES

Anselin, L. (1995). Local indicators of spatial association-LISA. *Geographical Analysis*, 27, 93-115.

ArcGIS (2012). Cluster and outlier analysis (Anselin Local Moran's I). *ArcGIS Help Resource Center*.

Beavon, D.J. & Brantingham, P.L. (1994). The influence of street networks on the patterning of property offenses. *Criminal Prevention*, 2, 115-148.

Bellair, P.E. & Browning, C.R. (2010). Contemporary Disorganization Research: An Assessment and Further Test of the Systemic Model of Neighborhood Crime. *Journal of Research in Crime and Delinquency.* 47, 496-521.

Berg, M.T. & Loeber, R. (2011). Examining the neighborhood context of the violent offending-victimization relationship: A prospective investigation. *Journal of Quantitative Criminology*, 27, 427-451.

Bernard, T.J. & Snipes, J.B. (1996). Theoretical integration in criminology. In (Michael Tonry, ed.) *Crime and Justice: A Review of Research*, 20, University of Chicago Press: Chicago, 301-348.

Bernasco, W. & Block, R. (2009). Where offenders choose to attack: A discrete choice model of robberies in Chicago. *Criminology* 47, 93-130.

Black, D. (1983). Crime as social control. *American Sociological Review*, 48, 34-45.

Blalock, H. (1967). *Toward a Theory of Minority-Group Relations*. New York: Wiley.

Blumstein, A. & Cork, D. (1996). Linking gun availability to youth gun violence. *Law and Contemporary Problems,* 5, 5-24.

Blumstein, A. & Wallman, J. (2006). *The Crime Drop in America, Revised Edition*. New York: Cambridge University Press.

Blumstein, A., (1995). Youth violence, guns, and the illicit-drug industry. *The Journal of Criminal Law & Criminology*, 86, 10-36.

Braga, A.A. (2012). Interpreting the empirical evidence on illegal gun market dynamics. *Journal of Urban Health*. 89, 779-793.

Braga, A.A., Kennedy, D.M., Waring, E.J., & Piehl A.M. (2001). Problem-oriented policing, deterrence, and youth violence: An evaluation of Boston's Operation Ceasefire. *Journal of Research in Crime and Delinquency*, 38, 195-226.

Bright, D.A & Ritter, A. (2010). Retail price as an outcome measure for the effectiveness of drug law enforcement. *Drug Policy*, 21, 359-363.

Bucher, J., Manasse, M., & Tarasawa, B. (2010). Undocumented victims: An examination of crimes against undocumented male migrant workers. *Southwest Journal of Criminal Justice*, 7, 159-179.

Bureau of Alcohol, Tobacco, Firearms and Explosives (2009). Fact Sheet. *Pubic Affairs Division*, Washington, D.C.

Bureau of Alcohol, Tobacco, Firearms and Explosives (2009). Newell Testimony. Retrieved at http://www.atf.gov/press/speech/2009/032409_newell-testimony.htm. on July 15, 2012.

Bureau of Alcohol, Tobacco, Firearms and Explosives (2011). Firearm Commerce in the United States, Washington, D.C.

Bureau of Justice Statistics (2009). Background and status of incident-based reporting and NIBRS. Retrieved at http://www.jrsa.org/ibrrc/background-status.shtml on July 6, 2012.

Bureau of Labor and Statistics (2009). Annual employment data.

Bureau of the Census, U.S. Department of Commerce (2009). Metropolitan and Micropolitan Statistical Areas of the United States and Puerto Rico.

Bursik, R.J. & Grasmick, H.G. (1993). Economic deprivation and neighborhood crime rates, 1960-1980. *Law and Society Review*, 27, 263-284.

Bursik, R.J. (1988). Social disorganization and theories of crime and delinquency: Problems and prospects. *Criminology* 26, 519-551.

Center for Disease Control and Prevention (2009). Assaults or homicide. Retrieved at http://www.cdc.gov/nchs/fastats/homicide.htm. on June, 4 2012

Center for Responsive Politics (2012). Lobbying spending by major gun rights and gun control groups, 1997-2003 retrieved at http://www.opensecrets.org/news/issues/guns/lobbying.php on July 28, 2012.

Cleveland, W.S. (1979). Robust locally-weighted regress and smoothing scatterplots. *Journal of the American Statistical Association*, 74, 829-836.

Clodfelter, T.A., Turner, M.G., Hartman, J.L. & Kuhns, J.B. (2010). Sexual harassment victimization during emerging adulthood: A test of routine activities theory and a general theory of crime. *Crime and Delinquency,* 56, 455-481.

Cloward, R.A. (1959). Illegitimate means, anomie, and deviant behavior. *American Sociological Review,* 24, 164-176.

Cohen, L.E. & Felson, M. (1979). Social change and crime rate trends: A routine activity approach, *American Sociological Review,* 44, 588-608.

Cook, R.D. (1977). Detection of influential observations in linear regression. *Technometrics*, 19, 15-18.

Cook, P.J. (1979). The effect of gun availability on robber and robbery murder: A cross sectional study of fifty cities. *Policy Studies Review Annual,* 3, edited by R.H. Haveman and B.B. Zellner. Beverly Hills: SAGE, 220-257.

Cook, P.J. & Ludwig J. (2004). Does gun prevalence affect teen gun carrying after all? *Criminology*, 42, 27-54.

Cook, P.J. (1981). The effect of gun availability on violent crime patterns. *The ANNALS of the American Academy of Political and Social Science*, 455, 63-79.

Coomber, R. (2010). Reconceptualising drug markets and drug dealers—the need for change. *Drugs and Alcohol Today*, 10, 10-13.

Copes, H., Kovandzic, T.V., Miller, J.M., & Williamson, L. (2009). The lost cause? Examining the southern culture of honor through defensive gun use. *Crime & Delinquency*, 58, 1-26.

Cornish, D. & Clarke, R.V. (2006). Understanding crime displacement: An application of rational choice theory. *Criminology*, 25, 933-948.

Corsaro, N., Hunt, E.D., Hipple, N.K., & McGarrell, E.F. (2012). Overview of: The impact of drug market pulling levers policing on neighborhood violence: An evaluation of the High Point drug market intervention. *Criminology & Public Policy*, 11, 165-166.

Corzine, J., Creech, J. & Huff-Corzine, L. (1983). Black concentration and lynching in the South: Testing Blalock's Power-Threat Hypothesis. *Social Forces*, 61, 774-796.

Corzine, J., Huff-Corzine, L., & Whitt, H. P. (1999). Cultural and subcultural theories of homicide. *Homicide: A sourcebook of social research*, 42-57.

Cronbach, L.J. (1951). Coefficient alpha and the internal structure tests. *Psychometrika,* 16, 297-334.

Davidson, L.L., Durkin, M.S. Kuhn, L. O'Connor, P. Barlow, B., & Heagarty, M.C. (1994).The impact of the Safe Kids/Healthy Neighborhoods Injury Prevention Program in Harlem, 1988 through 1991 *American Journal of Public Health* 84, 580–586.

District of Columbia v. Heller (2008). Unites States Supreme Court, 554 U.S. 570.

Doerner, W.G. (1983). Why does Johnny Reb die when shot? The impact of medical resources upon lethality. *Sociological Inquiry,* 53, 1-15.

Doerner, W.G. (1988). The impact of medical resources on criminally induced lethality: A further examination. *Criminology*¸ 26, 171-180.

Federal Bureau of Investigation. (2000). *Crime in the United States, 2009*: *Uniform Crime Reports*. Retrieved at http://www2.fbi.gov/ucr/cius2009/offenses/violent_crime/murder_homicide.html. on May 9, 2012

Felson, R.B. & Bonkiewicz, L. (2011). Guns and trafficking in crack-cocaine and other drug markets. *Crime and Delinquency*, 59, 319-343.

Felson, R.B. & Messner, S.F. (1996). To kill or not to kill? Lethal outcomes in injurious attacks. *Criminology,* 34, 519-545.

Felson, R.B. & Pare, P. (2010). Gun cultures or honor cultures? Explaining regional and race differences in weapon carrying. *Social Forces,* 88, 1357-1378.

Felson, R.B. & Steadman, H. (1983). Situational factors in disputes leading to criminal violence. *Criminology*, 21, 59-74.

Gallup (2011). Self-reported gun ownership in the U.S. is highest since 1993. *Gallup Incorporated*.

Gaziarifoglu, Y. (2011). Risk factors of dealing in open-air markets. *RTM Insights,* 13, 18-24.

Goldstein, P.J. (1985). The drugs/violence nexus: A tripartite conceptual framework. *Journal of Drug Issues*, 15, 493-506.

Haas, S.M., Jarvis, J.P, Jefferis, E., & Turley, E. (2007). Gun availability and crime in West Virginia: An examination of NIBRS Data. *Justice Research and Statistics Association*. 9, 139-157.

Hardy, M.S. (2002). Behavior-oriented approaches to reducing gun violence. *The Future of Children* (Woodrow Wilson School/The Brookings Institution) 12: 101–118.

Harocopos, A. & Hough, M. (2005). Drug dealing in open-air markets. Washington, DC: Office of Community Oriented Policing Services, U.S. Department of Justice, 1-4.

Harris, A.R., Thomas, S.H., Fisher, G.A., and Hirsch, D.J. (2002). Murder and medicine: The lethality of criminal assault 1960-1999. *Homicide Studies*, 6, 128-166.

Hemenway, D. & Miller, M. (2000). Firearm availability and homicide rates cross 26 high-income countries. *Journal of Trauma-Injury Infection & Critical Care*, 49, 985-988.

Hepburn, L.M. & Hemenway, D. (2004). Firearm availability and homicide: A review of the literature. *Aggression and Violent Behavior,* 9, 417-440.

Holmes, R.M. & Holmes, S.T. (1996). *Profiling violent crimes.* Thousand Oaks, CA: Sage.

Hoskin A.W. (2001). Armed Americans: The impact of firearm availability on national homicide rates. *Justice Quarterly*, 18, 596-592.

Hoskin, A.W. (2011). Household gun prevalence and rates or violent crime: A test of competing gun theories. *Criminal Justice Studies* 24, 125-136.

Jaques, S. (2010). The necessary conditions for retaliation: Toward a theory of non-violent and violent forms in drug markets. *Justice Quarterly*, 27, 186-205.

Kadiyali, V., Chintagunta, P. & Vlcassim, N. (2000). Manufacturer-retailer channel interaction and implications for channel power: An empirical investigation of pricing in a local market. *Marketing Science*, 19, 127-148.

Kaplan, M.S. & Geling, O. (1998). Firearm suicides and homicides in the United States: regional variations and patterns of gun ownership. *Social Science & Medicine*, 46, 1227-1233.

Kasarda, J. and Janowitz, M. (1974). Community attachment in mass society. *American Sociological Review*, 39, 328-339.

Kellermann, A.L., Rivara, F.P., Rushforth, N.B., Banton, J., Reav, D.T., Francisco, J., Locci, A.B., Prodzinski, J., Hackman, B.B. & Somes, G. (1992). Suicide in the home in relation to gun ownership. *New England Journal of Medicine*, 327, 467-472.

Kennedy, L.W., & Forde, D.R. (1990). Routine activities and crime: An analysis of victimization in Canada. *Criminology*, 28, 137-151.

Killias, M. (1993). International correlations between gun ownership and rates of homicide and suicide. *Canadian Medical Association Journal*, 148, 1721-1725.

Kleck, G. (2004). Measures of gun ownership levels for macro-level crime and violence research. *Journal of Research in Crime and Delinquency*, 41, 3-36.

Kornhauser, R. (1978). *Social Sources of Delinquency*. University of Chicago Press: Chicago.

Krug, A.S. (1967). A statistical study of the relationship between firearm licensing laws and crime rates. *Congressional Record*, H9366-H9370.

Lanier, C. (2010). Structure, culture, and lethality: An integrated model approach to American Indian suicide and homicide. *Homicide Studies*, 14, 72-89.

Light, M.T. & Harris, C.T. (2012). Race, space, and violence: Exploring spatial dependence in structural covariates of White and Black violent crime in US counties, 28, 559-586.

Linsky, A. & Straus, M. (1986). *Social stress in the United States: Links to regional patterns in crime and illness,* Auburn House: Dover, MA.

Martinez, R., Rosenfeld, R., & Mares, D. (2008). Social disorganization, drug market activity, and neighborhood violent crime. *Urban Affairs*, 43, 846-874.

McCall, P.L., Land, K.C., & Parker, K.F. (2010). An empirical assessment of what we know about structural covariates of homicide rates: A return to a classic 20 years later. *Homicide Studies*, 14, 219-243.

Messner, S.F. (1983). Regional and racial effects on the urban homicide rate: The subculture of violence revisited. *American Journal of Sociology,* 88, 997-1007.

Messner, S.F. & Sampson, R.J. (1991). The sex ratio, family disruption, and rates of violent crime: The paradox of demographic structure. *Social Forces*, 69, 693-713.

Miethe, T.D. & McDowall, D. (1993). Contextual effects in models of criminal victimization. *Social Forces,* 71, 741-759.

Miller, M., Azrael, D., & Hemenway, D. (2002). Rates of household ownership and homicide across US regions and states, 1988-1997. *Public Health*, 92, 1988-1993.

Miller, M., Azrael, D., & Hemenway, D., (2002). Household firearm ownership and suicide rates in the United States. *Epidemiology,* 13, 517-524.

Miller, M., Lippmann, S.J., Azrael, D., & Hemenway, D. (2007). Household firearm ownership and rates of suicide across 50 states. *Journal of Trauma Injury, Infection and Critical Care* 62, 1029-1035.

Moran, P. A. P. (1950). Notes on continuous stochastic phenomena. *Biometrika* 37, 17-23.

Morenoff, J.D., Sampson, R.J., & Raudenbush, S.W. (2001). Neighborhood inequality, collective efficacy, and the spatial dynamics of urban violence. *Criminology*, 39, 517-560.

Morselli, C. (2012). Assessing network patterns in illegal firearm markets. *Crime, Law and Social Change* 57, 129-149.

Mustaine, E.E. & Tewksbury, R. (1997). Obstacles in the assessment of routine activity theory. *Social Pathology*, 3, 178-194.

Mustaine, E.E. & Tewksbury, R. (1997). Predicting risks of larceny theft victimization: A routine activity analysis using refined lifestyle measures. *Criminology*, 36, 829-858.

National Institute of Justice (2005). Gun violence: How prevalent is gun violence in America? Washington, D.C.: *Bureau of Justice Statistics.*

National Institute of Justice (2009). Gun violence: Non-fatal firearm-related violent crimes 1993-2009. *Bureau of Justice Statistics.*

National Institute of Justice (2012). Drugs and crime facts. Washington, D.C.: *Bureau of Justice Statistics.*

National Incident Based Reporting System, (2010). National Incident Based Reporting System Crime Data for Virginia and Iowa.

Nisbett, R.E. & Cohen, D. (1996). *Culture of Honor: The Psychology of Violence in the South. New Directions in Social Psychology.* Boulder: Westview Press.

O'Brien, R.M. (1985). *Crime and victimization data*. Beverly Hills, CA: Sage.

Office of National Drug Control Policy (2010). HIDTA Designation Process and Authorizing Language. Retrieved at http://www.whitehouse.gov/ondcp/hidta-designation-process on March 4, 2013.

Osgood, D.W. (2000). Poisson-based regression analysis of aggregate crime rates. *Journal Quantitative Criminology*, 16, 21-43.

Osgood, D.W. & Chambers, J.M. (2000). Social disorganization outside the metropolis: An analysis of rural youth violence. *Criminology* 38, 81-116.

Ousey, G. C. & Lee, M. R. (2004). Investigating the connections between race, illicit drug markets, and lethal violence, 1984-1997. *Journal of Research in Crime and Delinquency*, 41, 352-383.

Ousey, G.C. (1999). Homicide, structural factors, and the racial invariance assumption. *Criminology*, 37, 405-426.

Patillo, M.E. (1998). Sweet mothers and gangbangers: Managing crime in a black middle-class neighborhood. *Social Forces*, 76 747-774.

Reed, J.S. (1972). Percent black and lynching: A test of Blalock's theory. *Social Forces*, 50, 356-360.

Resignato, A.J. (2000). Violent crime: a function of drug use or drug enforcement? *Applied Economics*, 32, 681-688.

Reuter, P. (2009). Systemic violence in drug markets. *Crime, Law and Social Change*, 52(3), 275-284.

Reuters (2007). The United States has 90 guns for every 100 citizens, making it the most heavily armed society in the world, a report on Tuesday said. *Reuters News Service*.

Rice, K.J. & Smith, W.R. (2002). Socioecological models of automotive theft: Integrating routine activity and social disorganization approaches. *Journal of Research in Crime and Delinquency*, 39, 304-336.

Rosa, M., Lambert, E. & Gropper, B., (1990). *Drugs and Violence: Causes, Correlates, and Consequences*. U.S. Department of Health and Human Services: National Institute on Drug Abuse.

Roundtree, P., Land, K.C. & Miethe, T.D. (1994). Macro-micro integration in the study of victimization: A hierarchical logistic model analysis across Seattle neighborhoods. *Criminology*, 32, 387-414.

Sampson, R.J. & Wooldredge (1987). Linking the micro- and macro-level dimensions of lifestyle-routine activity and opportunity models of predatory victimization. *Journal of Quantitative Criminology*, 3, 371-393.

Sampson, R.J. and Groves, W.B. (1989). Community structure and crime: testing social-disorganization theory. *American Journal of Sociology*, 94(4), 774-802.

Sampson, R. (2004). Neighborhood and community. Collective efficacy and community safety. *New Economy*, 11, 106-113.

Sampson, R.J., Raudenbush, S.W., & Earls, F. (1997). Neighborhoods and Violent Crime: A multilevel study of efficacy. *Science*, 277, 918-924.

SAS Institute Inc. (1999). *SAS/STAT User's Guide, Version 8*. Cary, North Carolina: SAS Institute, Inc.

Schwartz, D. & Pitts, V.L. (1995). Exploring a feminist routine activities approach to explain sexual assault. *Justice Quarterly*, 12, 9-31.

Shaw, C.R. and McKay, H.D. (1942*). Juvenile delinquency and urban areas*. Chicago, IL: University of Chicago Press.

Sheley, J.F. & Wright, J.D. (1993). Motivations for gun possession an carrying among serious juvenile offenders. *Behavioral Science & the Law*, 11, 375-388.

Sherman, L.W., Gartin, P.R. & Buerger, M.E. (1989). Hot spots of predatory crime: Routine activities and the criminology of place. *Criminology*, 27, 27-56.

Simcha-Fagan, O. & Schwartz, J.E. (1986). Neighborhood and delinquency: An assessment of contextual effects. *Criminology*, 27, 27-55.

Smith, W.R., Frazee, S.G., & Davison, E.L., (2000). Furthering the integration of routine activity and social disorganization theories: Small units of analysis and the study of street robbery as a diffusion. *Criminology*, 32, 489-524.

Spano, R., Freilich, J.D., & Bolland, J. (2008). Gang membership, gun carrying, and employment: Applying routine activities theory to explain violent victimization among inner city, minority youth living in extreme poverty. *Justice Quarterly*, 25, 381-410.

Spelman, W. (1993). Abandoned buildings: Magnets for crime? *Journal of Criminal Justice*, 21, 481-495.

Stolzenberg, L. & D'Alessio, S.J. (2000). Gun availability and violent crime: New evidence from the National Incident-Based Reporting System. *Social Forces*, 78(4), 1461-1482.

Uniform Crime Reports (2012). Uniform crime report. *United States Department of Justice Federal Bureau of Investigation.*

Ulmer, J.T., Harris, C.T., & Steffensmeier, D. (2012). Racial and ethnic disparities in structural disadvantage and crime: White, Black, and Hispanic comparisons. *Social Science Quarterly*, 93, 799-819.

United States Census (2010). Iowa social characteristics.

United States Census (2010). Virginia social characteristics.

United States Department of Justice, Bureau of Justice Statistics (1995). Guns used in crime.

Vaughn, M.G. Perron, B.E., Abdon, A., Olate, R., Groom, R., & Wu, L. (2012). Correlates of handgun carrying among adolescents in the United States. *Journal of Interpersonal Violence,* 27, 2003-2021.

Vuong, Q.H. (1989). Liklihood ratio tests for model selection and non-nested hypotheses. *Econometrica* 57, 307-333.

Waterston, A. (1993). *Addicts in the political economy*. Philadelphia: Temple University Press.

Weaver, G.S., Clifford, J.E., Huff-Corzine, L., Corzine, J., Petee, T.A., & Jarvis, J.P. (2004). Violent encounters: A criminal event analysis of lethal and nonlethal outcomes. *Journal of Contemporary Criminal Justice.* 20, 348-378.

Weisburd, D. (2012). Bringing social context back into the equation. *Criminology and Public Policy*, 11, 317-326.

Weisburd, D., Green, L., Gajewski, F. & Belucci, C. (1992). Defining the drug market: The case of the Jersey City DMAP system. *National Criminal Justice Reference Service.* Rockville, MD.

Werb, D., Rowell, G., Guyatt, G., Kerr, T., Montaner, J. & Wood, E. (2011). Effect of drug law enforcement on drug market violence: A systematic review. *Drug Policy* 22(2), 87-94.

Wintemute G. (2000). *The crime drop in America*. Cambridge University Press: New York.

Wright, J.D., Rossi, P.H., & Daly, K. (1983). *Under the Gun: Weapons, Crime, and Violence in America*. Aldeline Publishing: New York.