5-7-2021

The Journey to Crime for Drug Offenders

Jennifer Schmitz

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The Journey to Crime for Drug Offenders

by

Jennifer Schmitz

A Capstone Project Submitted in Partial Fulfillment of the
Requirements for the Degree of Master of Science in Criminal Justice

Department of Criminal Justice

College of Liberal Arts

Rochester Institute of
Technology Rochester, NY
May 7, 2021

RIT

Master of Science in Criminal Justice

Graduate Capstone Approval

Student: **Jennifer Schmitz**
Graduate Capstone Title: **The Journey to Crime for Drug Offenders**

Graduate Capstone Advisor: **Dr. Janelle Duda-Banwar**
Date:

Table of Contents

Theoretical Perspectives: The Journey to Crime for Drug Offenders

Rochester Institute of Technology

Introduction

When a person wants to purchase drugs, they are not going to randomly choose a location, many factors will impact their location choice. A seller may choose to sell drugs in an area with abandoned buildings and a lack of natural lighting to avoid being seen. A drug buyer may choose a location that is close to other places they frequent such as home or work. However, the proximity to these locations may also cause a co-worker or neighbor to identify them, so they may travel a distance from their home before seeking drugs.

To understand how drug buyers and sellers choose the location to offend, we can use a Journey to Crime (JTC) framework. The JTC is the distance between their home and the location of the crime. Research has generally found that most offenders will travel relatively short distances to commit a crime, this finding is referred to as the *distance decay* function. Several criminological theories have been proposed to explain why most offenders do not travel far from their home to commit crimes. The most common theories are Routine Activities Theory and Crime Pattern Theory. These theories and their origins will be reviewed in this paper and applied to the JTC for drug offenders. As these theories do not consider the environmental effects on crime opportunities, Crime Prevention Through Environmental Design will be integrated to explain additional crime opportunities. This paper will conclude with an example of what type of travel behavior we would expect from drug offenders, based on this integration of theories, using the open-air heroin market located in Rochester, New York.

The Journey to Crime Framework

Studying the spatial characteristics of crime became more popularized in the 1960's and was further developed by Brantingham and Brantingham's (1981) work on environmental criminology (Van Koppen & De Keijser, 1997). Environmental criminology is the study of

spatial characteristics of a crime and how the environment influences spatial patterns of crime (Wortle & Townsley, 2016). The Journey to Crime falls under environmental criminology as travel distance is a spatial characteristic of crime.

Most studies on spatial characteristics of crime have been conducted in recent decades, however, there have been studies on how far criminals travel to commit crimes since the 1930's (White, 1932). White (1932) investigated several different environmental aspects of offenders who committed felonies, with the purpose of informing distribution of social and police services. The study began by dividing up Chicago into several zones and comparing the number of felons per zone with the number of felonies committed in that zone (White, 1932). To further investigate the relationship between residence and incident location they measured the distance from the center of the home census tract to the incident census tract, this was likely done using these approximations due to a lack of analytical tools. They identified that individuals committing property crimes traveled farther than violent crime offenders, this finding is still consistently identified in JTC work (White, 1932).

While this paper refers to the distance between the home and crime location as the Journey to Crime, several other names have been used over the years. Residence to crime, distance to crime, and crime trips have all been used to refer to the distance between these two locations. However, for analytical purposes, this is typically the distance between the two points and not the true path that is taken by the offender because the actual route taken is not usually known (Ackerman & Rossmo, 2015). The JTC may be represented as either a straight-line distance between the two points (referred to as the Euclidean distance) or the sum of the real distance between the two points (referred to as the Manhattan distance) (Ackerman & Rossmo, 2015). These strategies usually report very similar travel distances and are both generally

accepted in the field (Townsley, & Sidebottom, 2010; Ackerman & Rossmo, 2015).

Distance Decay Function and the Buffer Zone

Distance decay and buffer zones are proposed ideas to explain common findings in the JTC field. The distance decay function states that offenders will travel the shortest distance possible to commit a crime (Townsley, & Sidebottom, 2010). Distance decay is an exponential model which proposes that as distance increases between the home and crime location, the number of offenders committing crimes at the distance will decrease. In other words, most offenders will commit crimes close to their home. Numerous studies have found support for the distance decay function across violent, property, and drug crimes (Santtila, Laukkanen, & Zappalà, 2007; Block & Bernasco, 2009; Levine & Lee, 2013).

As distance between two locations increases, more resources, time, and money are required to travel to the destination. Most offenders are not willing to travel far distances because they are looking to maximize the reward from a crime while minimizing the cost. This idea is commonly referred to as the "least effort principle" (Ackerman & Rossmo, 2015). Offenders do not want to put in high amounts of effort if it is unnecessary to do so (Ackerman & Rossmo, 2015). For example, if an individual wants to purchase drugs and someone is selling drugs a block from their house, then they are likely to purchase there and not from someone two miles away. However, some types of offenders will choose to offend farther from their home, as found by Forsyth et al. (1992): individuals will travel farther to purchase drugs in an area of high deprivation. In one of the first studies examining JTC and drug offenders, Forsyth and colleagues (1992) found that these areas of deprivation had more drugs available making it easier to purchase drugs. This still follows the least effort principle as drugs in this area were easier to purchase, so while they may have traveled farther, they minimized the effort by finding a

location with easier to purchase drugs. If the reward increases, individuals may travel farther, but will do whatever they can do to minimize the cost. Something else to consider is that unlike other types of crimes, purchasing illegal drugs may cause offenders to behave in similar ways to the average consumer when purchasing legal goods. The "least effort principle" is a concept that guides human behavior as well as criminological theory. Routine Activities Theory and Rational Choice Theory are both rooted in the proposition that individuals are going to put in the least amount of effort to acquire a service or item they are seeking.

While the distance decay function is a widely accepted finding, the buffer zone is still controversial in the JTC field. For offenders, there is a proposed buffer space between the offender's home and the location in which they will commit a crime. This is attributed to the idea that offenders will not offend in the very near vicinity of their home address as this will increase the likelihood that a neighbor will recognize them (Van Koppen & De Keijser, 1997). While this theory is often proposed, there is a lack of support for the theory overall.

A recent systematic review of 33 studies on the JTC only identified 11 studies that provided support for the buffer zone (Bernasco & van Dijke, 2020). Several reasons are proposed for the lack of evidence regarding the buffer zone. The first is the lack of scientific rigor in determining what is a true buffer zone (Bernasco & van Dijke, 2020). Studies will often suggest that a buffer zone exists, but this determination was only based off of a visual investigation of a density map (Bernasco & van Dijke, 2020). The second reason for the lack of buffer zone support is that offenders have different buffer zones (Bernasco & van Dijke, 2020). Some individuals may know most of their neighbors and must travel several blocks to avoid recognition. Other offenders who live in areas with high rates of residential turnover may not know any neighbors allowing them to have a smaller buffer zone. The last possible explanation

is that the buffer zone only exists for some crime types but may not necessarily be a result of fear of recognition (Bernasco & van Dijke, 2020). Offenders may not offend near their home due to a lack of crime opportunity. For example, an individual living outside a city who is seeking Marijuana may only need to travel a few blocks to find someone selling. Whereas someone seeking opioids may have to travel a great distance to purchase substances. Drugs are illegal goods that need to be purchased and are not going to be available everywhere. Similar to how individuals shop for most goods, certain factors may affect where individuals choose to buy drugs.

The strong empirical support for the distance decay function indicates that most offenders will commit crimes near their homes, while the less empirically supported "buffer zone," posits that people will not offend within their neighborhood. However, the buffer zone currently lacks strong empirical support. Beyond these two JTC functions, there are some broader criminological theories that can give further insight into travel behavior of criminals. Crime Pattern Theory which incorporates aspects of Routine Activities Theory and Crime Prevention Through Environmental Design can explain the pattern of travel of drug offenders in an area with a drug market.

Routine Activities Theory and Crime Pattern Theory

Originally developed by Cohen and Felson (1979), Routine Activities Theory proposes that for a crime to occur there needs to be a motivated offender, a suitable target, and a lack of a capable guardian (Cohen & Felson, 1979). When these elements overlap in time and space, a crime will always occur and the lack of one of these elements will result in a crime not occurring. The first element, a motivated offender, is a person who has intentions to commit a crime. A suitable target is something that an offender identifies as desirable and is possible to

acquire. Targets may refer to individuals or buildings or residences. The last element is the capable guardian. Capable guardians are not limited to law enforcement or parents; security cameras can also act as a guardian. The second aspect of Routine Activities Theory encompasses "routine" daily events. Routine Activities Theory focuses on how patterns of illegal activity follow patterns of legal activity and daily routines (Cohen & Felson, 1979). Offenders are not likely to go out of their typical routine to commit a crime and will likely find a place to commit a crime that follows their daily routine (Cohen & Felson, 1979).

Empirical research has provided evidence in support of Routine Activities Theory. Research has found that Routine Activities Theory can apply to a range of different crimes including assault, bike theft, sexual deviance, and stalking victimization (Mustaine, & Tewksbury, 1999; Johnston-McCabe et al., 2011; Miller 2013; Levy, Irvin-Erickson, & La Vigne, 2018). In addition, some studies have found support for Routine Activities Theory regarding drug use (Miller 2013, de Jong, Bernasco, & Lammers, 2019). However, both of these focused on adolescents who may not necessarily act in the same way as adults regarding drug use. To examine how the theory applies to drug use, these studies used interviews and questionnaires (Miller 2013, de Jong, Bernasco, & Lammers, 2019). One of the studies focused specifically on one weekend and asked about where the study participants went, who was there, and what they did (de Jong, Bernasco, & Lammers, 2019). This allowed researchers to gather information on the three aspects of Routine Activities Theory. The other study asked generally about what activities the individuals participated in and their behaviors in order to test the theory (Miller 2013).

With all types of criminological theory, there are limitations to what a theory can explain. Routine Activities Theory lacks explanation of what motivates an individual to commit a crime.

While the theory does state that a motivated offender needs to exist, the theory does not define what drives the offender to commit a crime. For this study we are specifically interested in drug sellers and drug buyers. The motivation behind committing these two crime types could vary significantly. Sellers may be interested in making money whereas buyers are likely looking to get high. Furthermore, Routine Activities Theory does not explain why a crime can occur with a guardian present. For example, a bank with security personnel and guards would appear to have a capable guardian, however individuals still attempt to rob banks. Routine Activities Theory does not explain how this crime can occur with only two of the elements. Routine Activities Theory may also be difficult to apply to drug users who may be under the influence at the time of the crime: they may not notice capable guardians or may go far out of their way to acquire drugs. While it may not explain drug users, drug sellers would most likely follow aspects of this theory.

Routine Activities Theory is closely related to Crime Pattern Theory. Routine Activities Theory proposes what elements must occur for a crime to occur whereas Crime Pattern Theory explains why the crime happens in certain locations. Originally developed by Brantingham and Brantingham (1984), Crime Pattern Theory states that offenders will choose to commit crimes along paths they routinely use (Iwanski, Frank, Dabbaghian, Reid, & Brantingham, 2011). Crime Pattern Theory suggests that familiarity with areas occurs through daily routines and offenders will choose to offend in familiar areas over an equivalent unfamiliar area. Locations along the path of the offender are considered their nodes. Their nodes include locations such as their work, school, home, or recreation locations (Levy, Irvin-Erickson, & La Vigne, 2018). The paths between the nodes are the offender's awareness path (Iwanski, Frank, Dabbaghian, Reid, & Brantingham, 2011). The awareness path and the nodes are then referred to as an individual's

activity space (Bernasco, 2010). The activity spaces of an offender are not consistent over their lifetime; all current and former activity spaces make up an individual's awareness space (Bernasco, 2010). The awareness space also contains the distance that the eye can see away from each activity space. The awareness space represents a much broader area that a criminal is aware of that they may choose to commit a crime within. Crime Pattern Theory states that when an offender's activity space overlaps with a target's activity space, then a crime may occur. Offenders will not go outside of their awareness or activity space to commit a crime.

Empirical support for Crime Pattern Theory was found by Iwanski et al. (2011) who developed a Criminal Movement Model. The Criminal Movement Model identified an offender's residence, their crime location, and likely attractor nodes. An attractor node is an area that by design attracts/brings people to it, such as a shopping center, recreation center, or a sports arena. Iwanski and colleagues (2011) created activity and awareness spaces for each offender in their study. Using this model, they looked at how far out from the awareness space an offender went to commit a crime. Overall, they found that 30% of people committed crimes within 50 meters of the identified path and 70% were within 500 meters (Iwanski et al., 2011). These findings demonstrate empirical support for Crime Pattern Theory.

Crime Pattern Theory has several limitations that prevent the theory from being widely used. Crime Pattern Theory lacks explanation for how groups choose locations to commit a crime. Crime Pattern Theory focuses on how the individual interacts with the environment and how this results in crime, but the theory does not cover the possibility that an offender might have a co-offender. People often commit a crime with another individual, but does this mean that they will only offend in a place where they are both familiar or where only one of them is familiar? In addition, the practical application of the theory is challenging as the offender's

activity and awareness spaces must be known to researchers or law enforcement. To know these spaces, data must be collected on every node an individual has and every path they take to those nodes. Lastly, unlike many other criminological theories, Crime Pattern Theory lacks strong empirical evidence. Only a few studies exist that test the validity of Crime Pattern Theory. Without strong empirical evidence, the application of Crime Pattern Theory is limited.

Crime Prevention Through Environmental Design

Crime Prevention Through Environmental Design (CPTED) utilizes the environment, both built and natural, to reduce crime opportunities (Cozens, Saville, & Hillier, 2005). Like the Journey to Crime, CPTED emerged from Brantingham and Brantingham's (1981) work on spatial characteristics of crime. Unlike other crime theories based on reducing crime in hot spots that use social and enforcement strategies, CPTED uses the environment to prevent crime opportunities. Like the Journey to Crime, CPTED is a part of the environmentally criminology field.

CPTED proposes that there are six elements that need to be addressed to prevent crime including territoriality, surveillance, activity support, image/maintenance, target hardening, and access control (Cozens, Saville, & Hillier, 2005). The first aspect, territoriality, refers to the idea that individuals need to feel ownership of the space (Cozens, Saville, & Hillier, 2005). A lack of ownership in an area provides opportunities for illegitimate users of an area to come in. Territoriality can be enforced using symbolic barriers such as no trespassing signs or barriers such as fences. Next is surveillance which results in the offender feeling as if they are being watched, individuals who feel they are being watched are less likely to commit crimes (Cozens, Saville, & Hillier, 2005). By increasing surveillance and making individuals feel they are being watched, crimes can be prevented. This can be done through several different methods including

informal ways such as windows of houses overlooking an area or formal security guards. Increasing lighting in an area to prevent dark spots and CCTV cameras can also cause an individual to feel watched. Surveillance in CPTED is similar to the Capable Guardian from Routine Activities Theory.

Another element of CPTED, access control, prevents crime by stopping individuals from being able to get to a target and increasing the perception of risk (Cozens, Saville, & Hillier, 2005). Locks, security personnel, lobbies, and road closures are all ways to decrease access to an area. The fourth element of CPTED is activity support, this element is about encouraging "safe" activities in an area (Cozens, Saville, & Hillier, 2005). This encourages use of the area providing natural surveillance with the presence of more individuals. Activity support can be done through signs encouraging safe activities, scheduled gatherings in a neighborhood, or designing an area to make it appear safe such as a park or a pool. Image/Management involves creating a positive and clean atmosphere in the environment. The image can be maintained through proper maintenance of outdoor spaces, removal of graffiti, and removing vacant premises. Keeping the positive image in an area reduces crime by demonstrating that there is high social cohesion in the area (Cozens, Saville, & Hillier, 2005). Furthermore, if the area is mistreated and neglected this will lead to further victimization by offenders in the area (Cozens, Saville, & Hillier, 2005). The last aspect of CPTED is target hardening or making it more difficult for a criminal to gain access to a target (Cozens, Saville, & Hillier, 2005). Typically, target hardening is done through increasing physical security including adding locks, alarms, and fences to a location.

Overall studies investigating the effectiveness of CPTED have found that it can be successful in reducing crime and increasing resident's feeling of safety (Cozens, Saville, & Hillier, 2005). In addition, property value has also been found to increase in areas with

interventions (Cozens, Saville, & Hillier, 2005). Interventions that use elements of CPTED are popular in North America, yet empirical evidence of success is not as widely available (Cozens, Saville, & Hillier, 2005). One application of CPTED in Portland, Oregon decreased burglaries, improved physical appearance, and increased quality of life (Cozens, Saville, & Hillier, 2005). Several other studies have provided effectiveness of these strategies. Many of these evaluations typically use numerous aspects which can make it difficult to discern which specific aspects of CPTED are effective or if the intervention as a whole is effective (Cozens, Saville, & Hillier, 2005). Places that use CPTED have identified positive impacts of the intervention, however more research should be conducted to further understand how each element of CPTED contributes to its effectiveness.

All six elements are important for ensuring the successful implementation of CPTED, yet individuals in the community may not be willing to participate in all of the elements. Fear in the neighborhood may push residents to heavily rely on target hardening and withdraw from the community. This could undermine CPTED due to the dependence on social interactions and relying on the community to take care of their neighborhood. In addition, CPTED is not always an easy solution especially in low income areas. Landscaping, security installations, and buildings all require money. Either the city or individuals will need to pay for these services which may not always be an option. If this burden is placed on individuals to fix up their property it may also be more cost efficient to just leave the area. One of the limitations of CPTED that will likely impact this study is that individuals under the influence may not be aware of all of these measures. If they are under the influence, they may not read signs or notice cameras that CPTED proposes will have an impact on them. Individuals who are high or drunk are not necessarily rational individuals that will act in the way CPTED proposes.

An example of an area with a lack of CPTED principles is an open-air heroin market. An open-air heroin market is a location where individuals will sell to any drug buyers who come to the location. These often include individuals out in the open selling drugs. Several environmental factors have been identified in drug markets that make them susceptible to criminal activity. Barnum et al. (2017) identified areas with foreclosures, broken street lighting, and problematic landlords were at a higher risk for drug dealing. Drug markets can take over local areas like parks for dealing drugs, thus preventing local citizens from using the area (Knutsson, 1997). Overgrown plants and vacant buildings are commonly identified in drug markets as they can conceal sales and drug use (Harocopos & Hough, 2005). These environmental characteristics allow for drug markets to thrive according to CPTED. If these environmental characteristics were fixed, it is expected that drug activity in this area would decline.

Theory Integration

Routine Activities Theory, Crime Pattern Theory, and Crime Prevention Through Environmental Design can be integrated to explain travel behavior of offenders in drug markets. Crime Pattern Theory posits that offenders choose to commit crimes in places that they frequent and are familiar with. Furthermore, Routine Activities Theory proposes that crime opportunities occur when the three elements overlap in time and space. This means that if an offender is performing their regular activities, every instance where these elements overlap in time and space, then the individual is provided an opportunity for a criminal act. An area that lacks environmental characteristics that prevent crime according to CPTED provides many opportunities for individuals passing through to commit crimes. In areas without these preventative characteristics there will be more areas with a lack of capable guardians and suitable

targets. Motivated offenders who live in or near an area with a lack of preventative characteristics will overlap with a suitable target and lack a capable guardian more often in time and space. Motivated offenders who live farther from areas lacking in preventative environmental characteristics will not have as many opportunities to offend.

The integration of these three theories justify why the distance decay function occurs. As described previously, the distance decay function shows that most offenders will commit crimes within their neighborhood. As distance increases between the home and crime location, the number of offenders committing crimes at that distance will decrease. Those that have all their nodes and their activity zone completely within an area that lacks environmental prevention factors will have numerous opportunities to commit crimes. Offenders are more likely to commit a crime within their awareness space and near their daily stops. Therefore, someone who has many opportunities within their awareness space is expected to not travel very far to commit a crime. Someone who has an activity space that mostly overlaps with areas with high environmental crime prevention is not going to have many opportunities for crime. When the person does have an opportunity to commit a crime, it is expected that it will be located far away from their home location.

Rochester's Open-Air Heroin Market Application

To further understand the integration of these theories, we can apply them to the local open-air heroin in Rochester, New York. This neighborhood in Northeast Rochester is referred to as the Project Area. While this study will mainly focus on individual characteristics that will impact the decision to travel to buy or sell drugs, neighborhood level characteristics can also impact these decisions. The neighborhood is one of the most deprived locations within Rochester. Currently, there are other studies investigating the neighborhood and an intervention,

Project CLEAN, has been working to disrupt the heroin market since 2018. These aspects of the neighborhood will likely have some impact on those who travel, but these neighborhood factors will not be utilized in the analysis of the current study.

Like many other drug markets the El Camino Neighborhood is characterized by vacant buildings, unusable public areas, and visible signs of disorder including litter (Altheimer, Duda-Banwar, & Klofas, 2018). This market lacks many factors that prevent crime according to CPTED. These environmental characteristics provide many opportunities for crimes within the neighborhood. According to these theories we expect that most offenders will live near or in the Project Area. We should find that as the distance increases from the Project Area the number of individuals offending at that distance will decrease. For example, an individual who lives, works, and shops in the Project Area and is seeking drugs to buy, will come across numerous opportunities to purchase drugs. Another individual who lives outside of the Project Area yet works there may only have half as many opportunities to purchase drugs in this area. A last individual who lives several miles outside the Project Area and has no connection to the area is unlikely to travel that far to purchase drugs in the area according to these theories. We would expect that most individuals who offend in the area will be familiar with the area beyond just purchasing or selling drugs in the area. Therefore, most offenders in the Project Area are likely to live close to the area and not travel very far to purchase or sell drugs.

Limitations

We expect that drug offenders in Rochester, New York will follow travel patterns that align with previous research and theories. However, drug offenders are not like other types of offenders. Opioids are highly addictive substances that can lead to an individual becoming addicted with only a few days of use. An addiction to opioids is defined as a strong need to

continue to use opioids even after it is medically unnecessary ("Opioid addiction - Genetics Home Reference - NIH", 2019). Individuals who are struggling with addiction may not act in ways that we are able to predict through these theories. The unpredictability of addiction is potentially a limitation to the theories as they focus on rational offenders. Individuals under the influence may also not notice enforcement efforts such as cameras or signs which will undermine many efforts of CPTED.

Currently, the studies that have focused on drug offenders have either looked at travel in a drug market or have not made a distinction between offenders purchasing or selling at a drug market compared to other areas. Drug markets may cause offenders to act in ways we may not expect. Individuals may travel much farther distances to get to a drug market if they know that it will be easy to purchase drugs there. Sellers may also travel farther to get to this area since the lack of environmental protections make it a more desirable selling location. The current theory explains why most offenders will commit crimes close to home, there is a lack of theory to explain why offenders may travel farther to offend in a specific location.

Another limitation in all the JTC literature is that most theory focuses on the distance decay function. There are several other findings in the JTC field, yet most theory applied in JTC literature focuses on distance decay. Further, JTC literature and theory has mostly examined urban and suburban areas. A few studies have investigated the JTC for rural areas, but most of these studies have been completed outside of the United States. Rural areas lack many resources that are found in urban and suburban areas. Monroe County, where Rochester is located, is surrounded by both suburban and rural areas. These theories may be limited in their application to the JTC in Monroe County due to the lack of application to rural regions.

Conclusion

Overall, Crime Pattern Theory, Routine Activities Theory, and Crime Prevention Through Environmental Design further our understanding of the distance decay function. While each theory has several limitations, the combination of these theories provides a better foundation for research on the Journey to Crime. Further theory should be developed to explain more than just why distance decay occurs. Research on the JTC is a promising technique for further understanding a variety of crime types and is especially promising in further analyzing the actions of drug offenders.

The Journey to Crime: Methodology

Rochester Institute of Technology

Introduction

To investigate the Journey to Crime for non-marijuana drug offenders in Rochester, NY we will use a quasi-experimental design. We are specifically interested in travel in Rochester due to the open-air heroin market located in Northeast Rochester. This heroin market has been in this location for decades, with a diminishing marijuana market slightly to the North of the area. The shift towards marijuana decriminalization in New York has resulted in a significant reduction in marijuana arrests, as well as changing market dynamics that are not present in the heroin market.

This paper will explain how the data was acquired and what steps were taken to clean the data for the analysis. The methodology for the analysis will be described in detail. The dependent and independent variables will be reviewed and a hypothesis for each variable will be explained. The paper will conclude with some of the challenges faced during this process of data collection and preparation.

Data and Methods

The Monroe Crime Analysis Center (MCAC) provided the two arrest datasets that will be included in the study. These datasets included arrest data from all law enforcement agencies in Monroe County. The first dataset included all arrests in Monroe County and the second included incidents where at least one individual was charged with a drug offense. These two arrest datasets will be modified in order to perform the statistical analysis.

An arrest dataset contains one line for every charge an individual receives for the incident. Each incident has a unique crime report (CR) number. Each individual also has a unique identifier that is assigned the first time that they come into contact with the local criminal justice system. The unique identifier is their MoRIS number (Monroe/Rochester Identification

System). This means that we can track individuals across the dataset even though we do not have their name. An example of several columns of an arrest dataset is below:

Figure 1: Example Arrest Dataset

CR Number	MoRIS ID	Charge
20-123456	123789	PL 220.16 12
20-123456	123789	PL 220.09 10
20-123456	178960	PL 220.09 10
20-123456	178960	PL 221.05
19-234567	123789	PL 220.03
19-234567	223456	PL 205.30

This data example in Figure 1 indicates that there were two separate crime incidents (20-123456 and 19-23456) during this time period. An incident may contain multiple individuals (MoRIS IDs) and multiple charges for each incident. For incident 20-123456, there were two separate people arrested (MoRIS ID), each for two charges (person 123789 for charges of PL 220.16 12 and PL 220.09 10). A charge refers to each crime that an individual was accused of and they can have several charges per arrest. An arrest refers to a collection of charges for one individual under a specific incident. For example, person 123789 had two arrests as they were involved in two different incidents.

The time period selected for this analysis was a period of five and a half years (January 2015 – June 2020). The original dataset included all incidents where the arrest date was between January 2015 and June 2020. The arrest date was the date the individual was arrested which, for drug offenses in particular, is usually on the date of the incident but can be up to several years

after the incident occurred. Since this dataset was extracted using the arrest date, there were several incidents that happened before our time frame of interest. We removed any offenses where the incident date did not occur between January 1st, 2015 and June 30th, 2020. If the incident date was not included for some reason, these incidents were also removed.

For this analysis, we wanted to limit our data to arrests in the City of Rochester. As a result, we only included incidents where Rochester Police Department, Monroe County Sheriff's Office, or New York State Police were the arresting agency. MCSO and NYSP were included because they both had a substantial number of cases where Rochester was the incident location. To ensure arrests by these agencies were within Rochester city limits we plotted these arrests on a map using latitude and longitude. Any incident that was within city limits or could not be plotted (i.e., missing location data) were removed from the analysis. As RPD has jurisdiction over Rochester, we were confident that these incidents would be located within Rochester. This was confirmed by plotting RPD incidents on a map using coordinates.

The original drug incident data set included incidents with New York State Penal Law 220 and Penal Law 221 charges (http://ypdcrime.com/penal.law/penal_law_title_m.htm). These two penal codes were put into five different offense categories including non-marijuana sale or intent to sell, non-marijuana possession, non-marijuana paraphernalia, marijuana sale, and marijuana possession (See Appendix A). However, driving under the influence of drugs (VTL 1192 04 or 4A) is a drug crime, but was not included in the original drug incident dataset. In order to add the DUI drug incidents, we utilized the all arrest dataset to find any incidents where there was a DUI drug charge. All these incidents were added to the original drug incident dataset unless they were previously included.

There were a few other changes made to the two original datasets before they were able

to be used for an analysis. A few incidents in the drug incident dataset did not have a drug charge associated with them, so these were removed. The age variable that was included was incorrectly calculated based on the date the dataset was created. Using the date of birth and date of incident provided we were able to create a new age variable that accurately represented the age of the offender at the time of the crime. Warrants were also removed from the dataset.

After the initial cleaning of the datasets was completed, we began converting these datasets into the final datasets that would be used for the analysis. As individuals can have multiple charges per arrest, we collapsed all their charges per incident onto one row of data. To do this, we gave each individual per offense a unique identification number. This unique ID was the CR number combined with their MoRIS ID number. Pivot tables in Excel were utilized to append incident related data to each line. The following independent variables that will be tested in the final analysis: drug type, gender, age, race, ethnicity, offense type, co-offenders, repeat offenders. How each variable was operationalized will be detailed in the dependent and independent variable section.

We included the crime trip for every arrest in the dataset. This means that individuals can have multiple crime trips included in the dataset and incidents with more than one offender will be represented by multiple trips. We chose to represent offenders in this way because offenders will not always choose the same place to offend. They may have been arrested for a wide variety of charges and only representing one trip does not reflect their true path. For example, an offender may have traveled several miles to burglarize a house. That same offender may have also assaulted their neighbor right in front of their house. Including every trip will help us represent the most accurate version of each trip. In addition, over the years offenders may move which could also impact their travel distance. One limitation of this approach is that we may not

be able to compare to other studies who chose to only use one path per offender regardless of the incidents they were involved in. We also may overcount some individuals who repeatedly took similar trips and underrepresent those who only took one.

As this study is looking at a market that typically sells heroin, all of our analysis will focus on non-marijuana offenses. Evidence has shown that there is a difference in travel distance between marijuana and non-marijuana offenses which further supports analyzing these groups separately (Johnson, et al., 2013). One analysis will compare these two groups of offenders to confirm this. However, as they are likely significantly different in travel distance the rest of the analysis will only investigate non-marijuana offenders. While our focus is heroin, the data provided to us does not include what type of substance the individual was arrested with beyond the charge they were arrested for. The Penal Law only distinguishes between marijuana and non-marijuana, so we are unable to have more specific categories.

Variables

Dependent Variable

The drug crime trip will be the unit of analysis for the current study and the physical distance traveled will be the dependent variable. A crime trip refers to the distance for one offender for an arrest. For this study, the Euclidean distance between the incident location and home address will be used. The Euclidean distance is the straight-line distance between two points and is commonly used in JTC literature to represent distance (Forsyth et al., 1992; Pettiway, 1995). Strengths and limitations to this approach were discussed in working paper one. As part of our initial analysis, we will review histograms of the overall distance traveled and for non-marijuana offenders specifically. Using these we will determine whether there is evidence of distance decay or the buffer zone. If we were to find distance decay, we would find

that as distance increased the number of offenders would decrease, this should look like an exponential decay. For the buffer zone, if the number of offenders who offended near their home was lower than any farther distance than there would be support for the buffer zone. If the number of offenders is always decreasing as distance increases, then this would be evidence against the buffer zone.

ArcGIS Pro software was utilized for plotting the incident and home locations. Individuals were only included in this study if the incident had latitude and longitude included for both the incident location and the home address. The coordinates provided by the analysis center were used to plot the current data. Typically, the coordinates provided by the analysis have higher success rates than locators available to the researchers. Within ArcGIS Pro, the incident path tool was used to link the incident and home location for each arrest based on the created unique ID. To calculate the physical distance between each set of points, the calculate geometry tool was used to convert the length of the lines to feet. The length for each of these incidents was appended to the original data file.

Independent Variables

Drug Type

The main research interest of this analysis is non-marijuana offenders' travel distance. As mentioned earlier, significant differences have been found between travel distance for different drug types. Nonetheless, it was still important to test this assumption with our current data. We expect to find differences between these groups and will therefore not include marijuana offenders in any other statistical tests.

To identify what type of drug an offender was arrested for we will have two variables, non-marijuana and marijuana. If an individual has at least one Penal Law 221 charge for an

incident, then that trip will be considered a marijuana related trip. If an individual has at least one Penal Law 220[1] charge for an incident, then that trip will be considered a non-marijuana related trip. This means that individuals may have one incident where they are coded as a marijuana offender and one incident where they are coded as a non-marijuana offender. It is also possible that an individual could have both a marijuana charge and a non-marijuana charge for a trip. The first analysis will be an independent samples t-test between marijuana offenders and non-marijuana offenders. These will be exclusive categories for this analysis, if someone was arrested for both charges in the same offense they will not be included, as this will result in individuals being double counted. Literature on drug offenders have identified that individuals will travel farther to purchase drugs other than marijuana (Forsyth et al., 1992, Johnson, Taylor, & Ratcliffe, 2013). Based on this previous literature, we hypothesize that individuals will travel farther for non-marijuana offenses than for marijuana offenses.

Gender

The gender of each offender was provided in the dataset, we will use this variable for our analysis. Currently, gender is a binary variable provided by MCAC and only lists females and males. To analyze the difference between male and female non-marijuana offenders, an independent samples t-test will be used. Previous research on the gender differences for the drug JTC has been mixed, a few studies have found that females will travel shorter distances (Pettiway, 1995, Levine & Lee, 2013). However, one of the studies has found that men travel farther than women for marijuana and cocaine, but not for heroin (Johnson et al., 2013). While there is a limited set of studies on the JTC for drug offenders, most of them identify differences

[1] There is one exception to this rule, Penal Law 220.06 04 is a 220 offense however it is for the possession of Marijuana, these offenses were coded as 221.

between the groups. We hypothesize that male non-marijuana offenders will travel farther than female non-marijuana offenders.

Race and Ethnicity

Besides gender, race and ethnicity can impact the distance an individual will travel to purchase or sell drugs. Similar to gender data, race data is gathered through self-report at the time of arrest or through officer observation. In the provided data, two columns indicate race and ethnicity. One of the columns had race which can be Black, white, or Asian. The second column indicates whether the individual is Hispanic or non-Hispanic. To compare the groups, we will divide these two categories into three groups, white (non-Hispanic), Black (non-Hispanic), and Latino (Hispanic individuals of all races). A few rows of data do not indicate race or ethnicity, as a result they will not be included in this analysis. Furthermore, Asian offenders will not be analyzed due to the small sample of Asian offenders (n = 9). A one-way ANOVA will be used to analyze differences between the three groups. Previous research has identified that white offenders will travel the farthest and Latino offenders will travel the shortest distance (Johnson et al., 2013). We hypothesize that white offenders will travel the farthest to purchase drugs followed by Black offenders. Latino offenders will travel the shortest distance of all offenders.

Age

As previously noted, the provided age variable was calculated incorrectly for our analysis. The created age variable based on date of birth and incident date will be used for this analysis. For this analysis, we will use a bivariate correlation and an independent samples t-test to analyze the relationship between age and travel distance. We believe there may be a linear relationship between age and distance traveled so a correlation was selected. However, previous

studies have used a binary test for age either with offenders under 18 or 26, as a result we will use both tests to study this difference (Johnson, et al., 2013; Levine & Lee, 2013). There were less than a hundred individuals under 18, therefore we will use individuals under 26 as proposed by Johnson et al. (2013). Within the drug JTC literature there are mixed findings on the effect of age on travel distance (Johnson, et al., 2013; Levine & Lee, 2013). The broader JTC literature has consistently found that younger individuals will travel shorter distances, likely due to a lack of ways to travel (Levine & Lee, 2013). Based on this literature, we would expect that younger offenders will travel shorter distances than older offenders.

Sellers and Buyers

Within the dataset, Penal Law 220 offenses can be divided into three categories: non - marijuana sale or intent to sell, non-marijuana possession, and non-marijuana paraphernalia. These are arrests for drugs other than marijuana, and beyond this, there is no recording of what type of drug the individual was arrested for. We will use the charge as a proxy for whether the individual is a buyer or seller, however sale offenses are primarily based on the quantity of drugs and not necessarily whether they were caught in the act of selling.

An independent samples t-test will be used to identify differences between these two groups. We will compare sale charges and drug paraphernalia charges to possession charges. Drug paraphernalia charges are included with sale charges as the penal code indicates most of the charges are related to distribution of non-marijuana. As samples must be mutually exclusive for this test, an arrest for an individual will only be included if they are arrested for charges in one of the two groups. If they are arrested for a charge in both groups, they will not be included as they cannot be double counted. Previous research has found that individuals will travel further to purchase drugs than they will to sell drugs (Johnson, 2016). As a result, we

hypothesize those arrested for Penal Law 220 sale and paraphernalia charges will not travel as far as individuals arrested for Penal Law 220 possession charges.

Co-Offenders

A co-offender incident is any crime where two or more individuals committed a crime together. For the current study, we will identify individuals who had a co-offender by incidents that listed more than one MoRIS ID (i.e., person). The coding process was completed prior to removing individuals who did not have home or incident address listed. Therefore, some incidents in the final file may only have one individual listed but will be coded as a co-offender incident. Even though they only have one individual, the actual incident would have had a co-offender. The co-offender would have been removed due to a lack of address, but their presence may still have impacted the other offender.

We will once again use an independent samples t-test to investigate statistical differences between trips of those who had a co-offender and those that did not. All trips of individuals involved in a co-offender incident will be included. Previous literature has only included one trip for each incident with a co-offender (Levine & Lee, 2013). This study will not use this same method as the trips of co-offenders can be different as they will likely not have the same home address, only including one individual will not represent every trip. Levine and Lee (2013) have previously found that individuals will travel farther if they have a co-offender when looking at all crimes. Based on this finding we would expect that drug offenders who offend with at least one another individual will travel farther than those who offend alone.

Repeat Offenders

Repeat offenders are individuals who have had previous contact with the criminal justice in the form of a previous arrest. As previously mentioned, a MoRIS ID was included in the

dataset and represents unique offenders. Our dataset only contains Rochester arrests and is limited to a period of five and a half years. Therefore, our repeat offender variable will be limited to offenses that occurred in this time period. A repeat offender was defined as someone who was arrested for more than one incident in the dataset. Using the all arrest dataset we identified any individuals who had more than one arrest, for any charge type not just drug arrests. We used any prior arrest because we believe that type of arrest will not change the effect that an arrest will have on behavior.

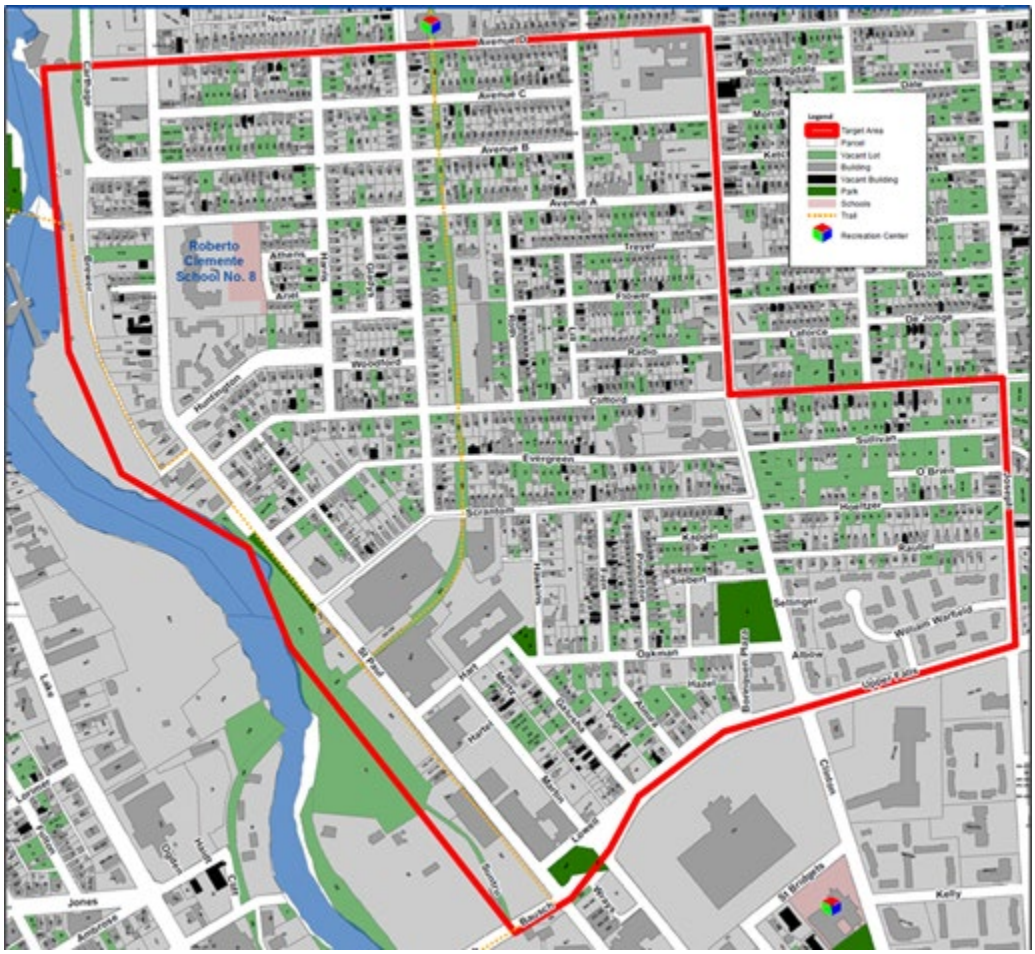
An independent samples t-test will compare repeat offenders to non-repeat offenders for non-marijuana arrests. Previous research for drug offenders has found that repeat drug offenders will travel farther, possibly due to individuals traveling farther to evade arrest (Johnson, et al., 2013). We hypothesize that non-marijuana repeat offenders will travel farther, regardless of their other charges.

Project Area

As mentioned in the introduction, this paper is analyzing the travel distance of offenders in and around a drug market. The drug market is in Northeast Rochester in an area referred to as the Project Area. Figure 2 below outlines the boundaries of the Project Area. A variable was added to the dataset indicating whether the incident location was in the Project Area. An independent samples t-test will be used to compare drug trips where the individual was arrested in the Project Area compared to an area within Rochester but outside of the Project Area. Previous research has found that people will travel farther to purchase drugs in an area with high deprivation (Forsyth et al., 1992). The Project Area has a very high level of deprivation, as evidenced by median household income, vacant property rate, etc. Besides being an area of deprivation, the presence of a drug market could make purchasing and selling drugs easier

leading to people traveling farther to buy or sell there. We hypothesize drug trips that end in the Project Area will be longer than those that end in another location in Rochester.

Figure 2: CLEAN Project Area



Challenges

One of the biggest challenges that we faced was collecting a complete and accurate dataset. The first dataset that was received for analysis did not include all MoRIS IDs which were needed for the analysis. There were also several incidents that were included in the drug arrest dataset, but they did not involve a drug arrest. Our next dataset did not include latitude and longitude which were needed for creating a distance variable. A third dataset did not include all the variables requested; two condensed datasets were given but they could not be appended to

the previous datasets. A final request for data was made that resulted in the datasets used for the current analysis. To our knowledge these datasets did not present any significant issues that would have impacted our analysis. However, through the process of receiving three incorrect datasets we are concerned about the possibility for further errors in the datasets. This process also provided evidence that researchers should scrutinize any dataset received from police or other criminal justice agencies. Studies using police data should provide evidence that their dataset is an accurate representation of what they asked for.

Conclusion

This paper proposed an analysis for the Journey to Crime in Rochester, New York to further understand the drug market in the area. This study will use a quasi-experimental approach and analyze eight different independent variables. Statistical analysis for each of these variables was proposed. The significance level used for each of these tests will be .05. In the next paper, we will provide the results of these statistical tests and examine how these compare to our hypotheses.

Results: The Journey to Crime for Drug Offenders in Rochester, NY

Rochester Institute of Technology

Introduction

This paper provides the results of the analysis conducted on distance to drug crime. The findings begin by showing the descriptive statistics to better understand the sample. We will also review the findings of several statistical tests designed to test the hypotheses proposed in a previous paper. The following hypotheses were tested:

1. Marijuana offenders will not travel as far as non-marijuana offenders.
2. Individuals arrested for sale and paraphernalia offenses will not travel as far as individuals arrested for possession offenses.
3. Male drug offenders will travel farther than female drug offenders.
4. White offenders will travel the farthest to offend, then Black offenders and the shortest distance will be traveled by Latino offenders.
5. Juvenile drug offenders will travel shorter distances than all other offenders.
6. Drug offenders will travel farther if they have at least one co-offender.
7. Repeat offenders will travel farther than non-repeat offenders.
8. Individuals arrested for incidents in the Project Area will travel farther than those traveling to other locations in Rochester.

The paper will conclude with a discussion on how these results compare to what we expected to find and what previous studies have found.

Data Overview

As mentioned in the previous paper the data utilized in this study was provided by Monroe County Crime Analysis Center. The data used in this analysis will be a drug arrest file which contains any incident where at least one individual had a drug charge. This data was collected between January 1st, 2015 through June 30th, 2020. There were 7,597 drug arrests

during this time period, however 2,025 did not contain coordinates for the incident or home address and had to be removed. As a result, the final dataset included 5,572 drug arrests. From this, we were mainly interested in non-marijuana offenses, so most of our analysis focused on 2,915 arrests that had at least one non-marijuana charge.

Results

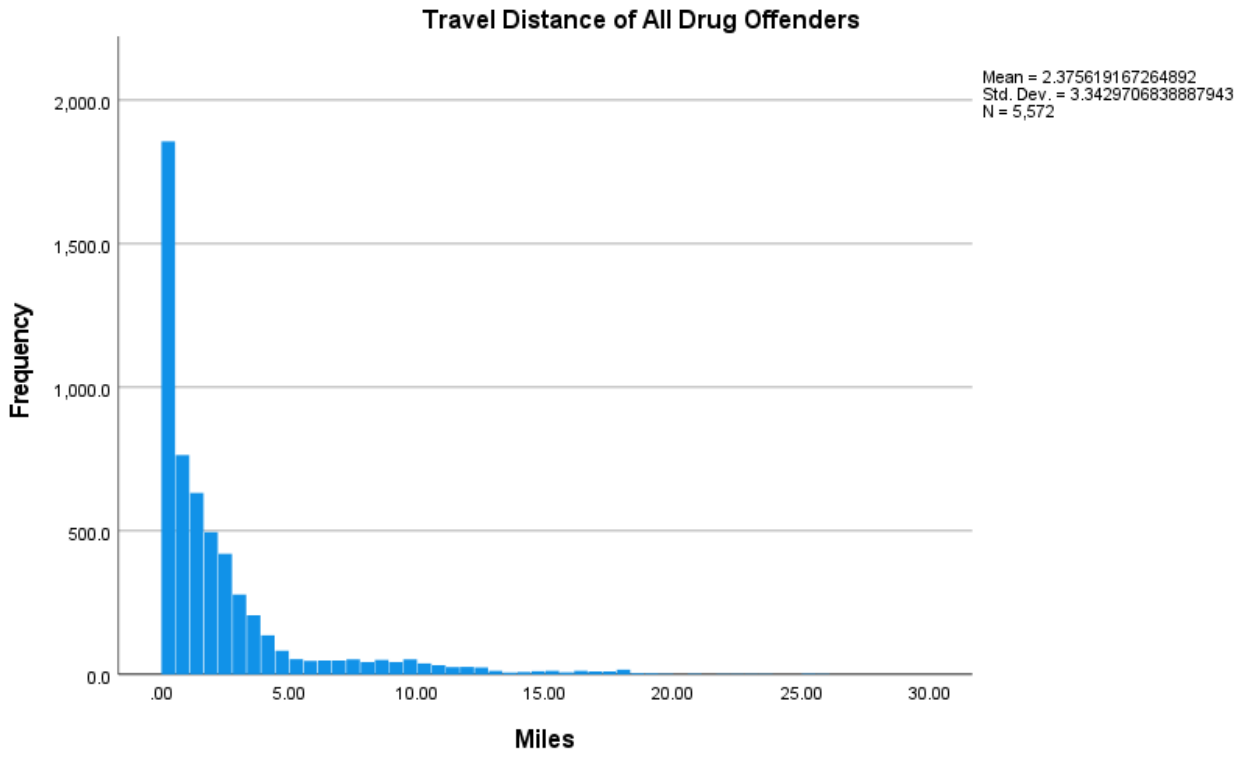
Overall, we found that, on average, individuals in the drug dataset traveled 2.37 miles. The farthest anyone traveled was 26 miles. Fifty percent of offenders traveled 1.25 miles or less. Of the 5,572 arrests 13% had the same home and incident address and therefore traveled 0 miles. Only 12.6% of offenders traveled greater than 5 miles. Figure 1 summarizes the distance traveled divided for each of the variables tested in this analysis. Figure 2 below displays the distribution of distance traveled of the drug offenders. Based on these results, we find evidence to support the distance decay function, as most offenders are offending relatively close to their home address. It also appears that there is no buffer zone based on this distribution as the number of offenders only decreases as distance increases.

Figure 1: Average Distance by Variables (n = 5,572)

Variables	n	Mean (miles)	Standard Deviation (miles)
All Offenders	5,572	2.37	3.34
Marijuana	2,144	2.26	3.22
Non-Marijuana	2,108	2.35	3.39
Male	2,544	2.25	3.17
Female	371	2.60	3.62
White	433	4.76	4.59
Latino	607	1.64	2.52
Black	1,864	1.93	3.10
Juvenile (under 26)	992	2.29	3.23
Adult	1,923	2.30	3.25
Sale	1,479	1.69	2.68
Possession	1,093	3.23	3.84
Co-Offender	1,016	2.05	2.97
No Co-Offender	1,899	2.42	3.37

Repeat	2,028	2.03	2.92
Non-Repeat	887	2.88	3.81
Project Area	449	1.69	2.41
Non-Project Area	2,466	2.40	3.36

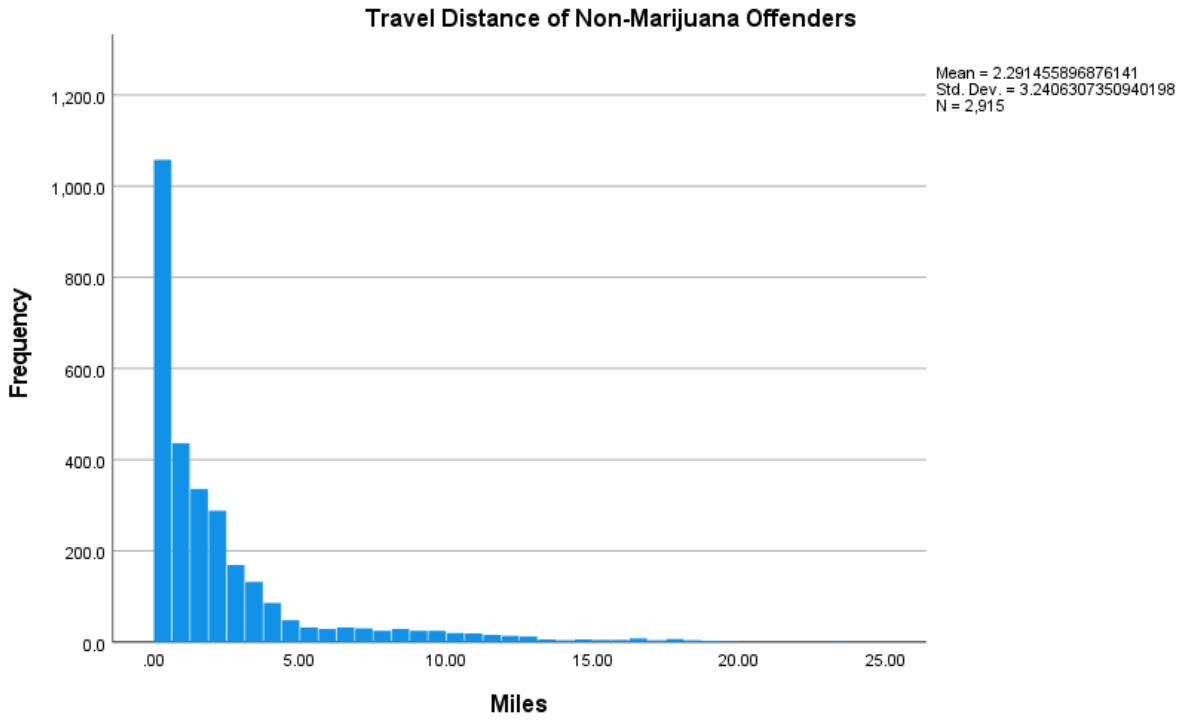
Figure 2: Travel Distance of All Drug Offenders (n = 5,572)



When only looking at non-marijuana offenses, the average travel distance decreased slightly to 2.29 miles. The farthest an individual traveled was 23 miles and fifty percent of offenders traveled 1.19 miles or less. Of the 2,915 arrests for non-marijuana offenses, 17% had the same incident and home location. Figure 3 below illustrates the travel distance distribution

for non-marijuana offenders. The distance decay function and the lack of a buffer zone appear to hold true for non-marijuana offenders as well. Non-marijuana and marijuana offenders had lower average travel distances compared to the overall drug dataset. We found that offenders who were arrested in drug incidents but did not have a drug charge traveled on average much farther. We included them in our overall statistics, but these offenders will not be included in any analysis due to their lack of drug charge. We are not sure why these offenders appear to be traveling farther than offenders with a drug charge.

Figure 3: Travel Distance of Non-Marijuana Offenders (n = 2,915)



Variables

Drug type

There were 2,951 arrests that had at least one marijuana charge and 2,915 arrests that had at least one non-marijuana charge. Of the marijuana charges, most (98%) of these offenders were arrested for possession charges. Possession arrests were less common for non-marijuana

offenders with only 48% being arrested for non-marijuana possession. On average, marijuana offenders traveled 2.23 miles and non-marijuana offenders traveled 2.29 miles.

Independent samples t tests require exclusive categories. Therefore, anyone who had both marijuana and non-marijuana charges was removed from the analysis. This resulted in 2,144 marijuana offenders and 2,108 non-marijuana offenders. There was not a statistically significant difference between the mean distance traveled by those who committed non-marijuana offenses (M = 2.35, SD = 3.39) and those who committed marijuana offenses (M = 2.26, SD = 3.22) $t(4{,}229.90) = -.859$, $p > .05$. This finding is not consistent with our hypothesis that non-marijuana offenders would travel farther.

Sale vs Possession

Of the 2,915 non-marijuana arrests 49% had a possession arrest, 58% had a sale charge, and 25% had a drug paraphernalia charge. These arrests were divided up into two groups, one group includes sale and drug paraphernalia, the other includes possession arrests. Any arrests that include a charge from both groups were not included. As a result, we have 1,479 arrests in the sale and paraphernalia group and 1,093 arrests in the possession group. Possession only offenders (M = 3.23, SD = 3.84) traveled significantly farther than individuals arrested for sale or possession of paraphernalia (M = 1.69, SD = 2.68) $t(1{,}844.05) = 11.925$, $p = .000$. This finding was consistent with our hypothesis that possession offenders would travel farther.

Gender

Of the non-marijuana arrests, 13% were women and 87% were men. The current study found that men travel an average of 2.25 miles and women travel an average of 2.60 miles. An independent samples t-test between these groups found that women (M = 2.60, SD = 3.62) traveled farther than men (M = 2.25, SD = 3.17), however this result was not statistically

significant $t(456.816) = -1.797$, $p = 0.073$. This finding does not support our hypothesis that women would travel shorter distances.

Race and ethnicity

Fifteen percent of the non-marijuana arrests were white offenders, 21% were Latino offenders, and 64% were Black offenders. There were 9 Asian offenders and 2 offenders who did not have race and ethnicity listed and were removed from the analysis. A one way ANOVA found that travel distance varies significantly by race and ethnicity $F(2, 903) = 166.42$, $p=.000$. Tukey's post hoc procedure indicated that Latino offenders ($M = 1.64$, $SD = 2.66$) and Black offenders ($M = 1.93$, $SD = 2.74$) traveled significantly less for non-marijuana offenses compared to white offenders ($M = 4.76$, $SD = 4.57$). There was not a significant difference between black and Latino offenders. This finding partially supports our hypothesis.

Age

Figure 3 illustrates the distribution of offenders by age. The number of offenders by age peaks around the late twenties before decreasing sharply. The average age of non-marijuana offenders was 31 years old. The youngest offender was 14 at the time of the offense and the oldest offender was 75. The correlation between travel distance and age at offense can be seen in scatter plot below (figure 4). As expected, based on the figure, there was not a significant correlation between travel distance and age. An independent samples t-test was also used to determine whether there were significant differences in travel distance for juvenile offenders. This test found that there were no significant differences in travel distances between those 26 and older ($M = 2.29$, $SD = 3.25$) and those younger than 26 ($M = 2.30$, $SD = 3.23$) $t(2,102.063) = -.122$, $p = 0.903$. Both of these findings did not support our hypothesis that juvenile offenders would travel shorter distances.

Figure 3: Number of Offenders by Age (n = 2,915)

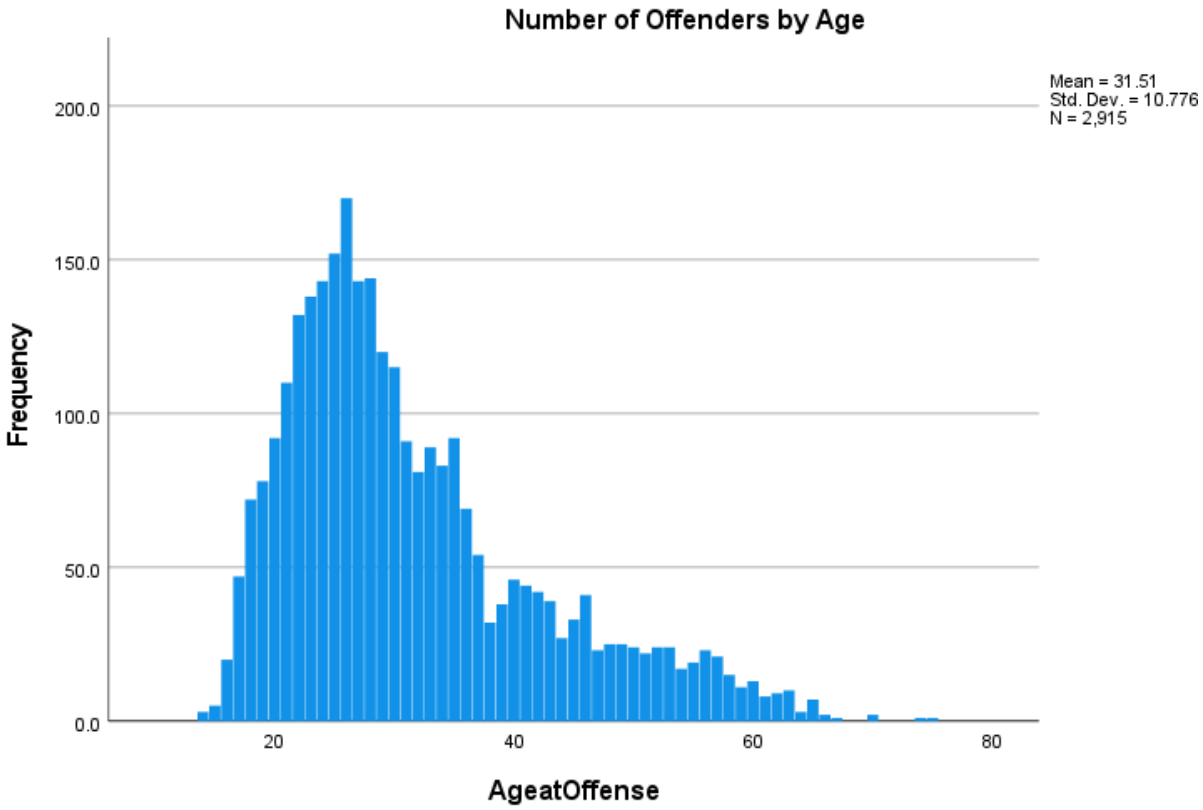
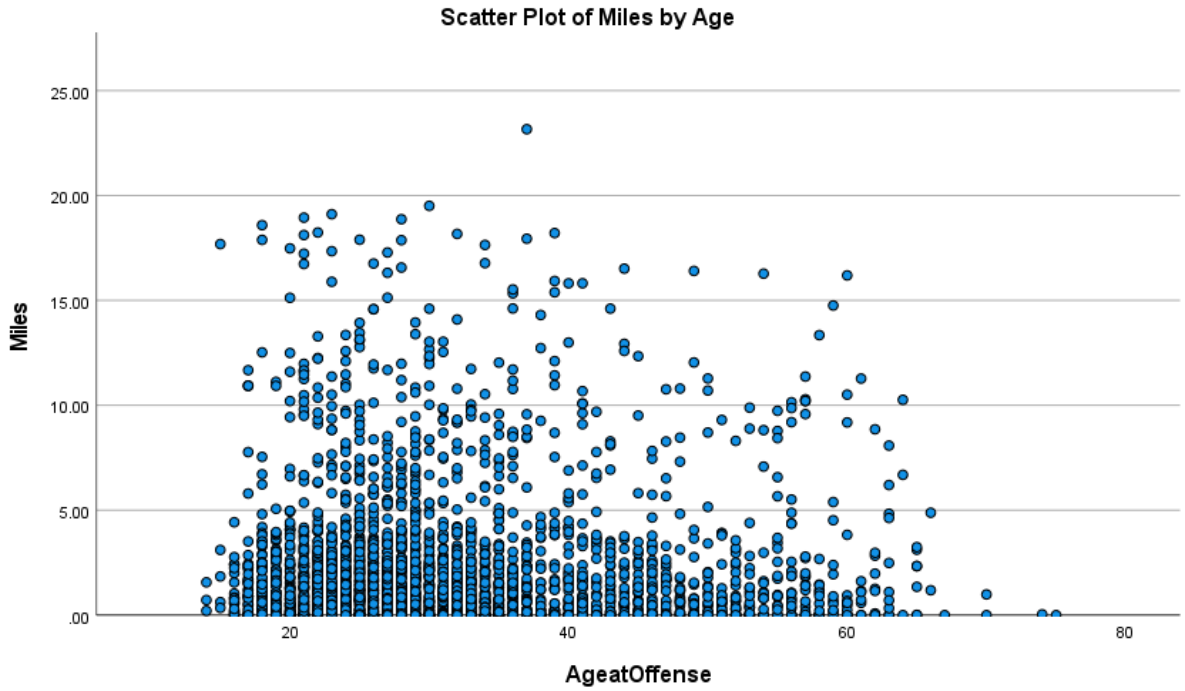


Figure 4: Scatter Plot of Miles by Age (n = 2,915)



Co-offenders

Most individuals offended by themselves, only one third of offenders were arrested with at least one other individual. Possession and sale offenders had a different likelihood of having a co-offender. Of the sale offenders, about 40% had a co-offender and about 24% of possession offenders had a co-offender charge. An independent samples t-test found there was a significant difference in travel distance between those with a co-offender and those without. Individuals without a co-offender (M = 2.42, SD = 3.37) traveled significantly farther than those who had a co-offender (M = 2.05, SD = 2.97) t(2,306.365) = 3.032, p = 0.002. This finding did not support our hypothesis that co-offenders would travel farther.

Repeat Offenders

Over two thirds of non-marijuana offenders (70%) were arrested for more than one crime

during the time period of the study. For some of these offenders, the crime was another drug crime, however some were arrested for other crime types. Those who had more than one arrest in the dataset ($M = 2.03$, $SD = 2.92$) traveled significantly shorter distances than those arrested only once during the time period ($M = 2.88$, $SD = 3.81$) $t(1{,}361.664) = 5.871$, $p = 0.000$. This finding was not confident with our hypothesis that repeat offenders would travel farther.

Project Area

The Project Area located in Northeast Rochester is the site of many non-marijuana arrests. Within the dataset used for this analysis 449 (15.4%) of the arrests were located within the Project Area. When comparing offender travel distance for incidents in and out of the Project Area, those with incidents in the Project Area ($M = 2.03$, $SD = 2.92$) traveled significantly shorter distances than those with incidents outside of the Project Area ($M = 2.88$, $SD = 3.81$) $t(1{,}361.664) = 5.871$, $p = 0.000$. These results were not consistent with our hypothesis that Project Area offenders would travel farther.

Discussion

Overall, this analysis resulted in many unexpected findings. Based on previous research we expected to find that marijuana offenders would travel significantly shorter distances compared to offenders arrested for a drug other than marijuana (Johnson, Taylor, & Ratcliffe, 2013). When looking at the average distance traveled for both groups, non-marijuana offenders traveled slightly farther, however this difference was not statistically significant. Previous research has only investigated differences between buyers of marijuana and other drugs. It is possible that including sellers in our analysis for both groups resulted in the lack of differences between the groups. Sellers and buyers are distinctly different groups and the different distributions of these groups between marijuana and non-marijuana offenders may have affected

the analysis. About 50% of non-marijuana offenders had a possession charge compared to marijuana offenders where over 98% were arrested for possession. Previous research has found that buyers travel longer distances than sellers (Johnson, 2016), if we only included buyers in this analysis, then we may have found evidence to support previous research.

Expected differences between the groups was part of the reason we did not include marijuana offenders in the rest of our analysis. However, even though we did not find those differences, the decriminalization of marijuana in New York and the differences between marijuana and other drugs supports our decision to keep these separate. Our analysis is interested in travel patterns of non-marijuana offenders so including marijuana offenders would have changed the focus of the study

Consistent with prior research (i.e., Johnson, 2016) we found that individuals who purchased non-marijuana drugs traveled farther than individuals who were arrested for sale of non-marijuana. This difference may be due to the different motives of drug sellers and buyers. Drug sellers are likely going to want to stay relatively close to their house to reduce the costs of offending and possibly due to being known for a specific location. Drug sellers also have the power to determine where they sell, while drug buyers have to go to where the product is sold. Buyers have a bit more freedom to choose where to offend and are likely going to make some buying decisions while under the influence which may lead to traveling further. If buyers hear of good drugs, they may be willing to travel farther to a location or if they are desperate for drugs, they may be willing to travel farther to get to a location.

Unlike Johnson (2016), the current analysis used New York State Penal Law instead of the UCR categorization. We utilized Penal Law over UCR code as the MCAC analyst stated this was not reliable in the dataset. By using Penal Law, we were able to include individuals arrested

for possession of paraphernalia which would not be included under sale by using UCR codes. Based on the Penal Law, we found that offenders arrested for paraphernalia are typically selling drugs, therefore including them in the seller category allows for a more accurate representation of drug sellers.

Partially consistent with prior research, we found that white offenders traveled significantly farther than Latino and Black offenders. Unlike previous studies, we did not find that Latino offenders traveled significantly shorter distances compared to Black and white offenders (Johnson, Taylor, & Ratcliffe, 2013). Studies that previously investigated race were able to differentiate between different drugs and found that Latino offenders traveled shorter distances to purchase heroin specifically. As the current study focuses on an area with a heroin market, we expected that many offenders would have been arrested for heroin and Latino offenders would travel shorter distances. Our data was not able to distinguish between different drugs beyond marijuana and other. It is possible that the ability to further refine our data by drug type would have identified these differences.

The differences between white offenders and non-white offenders could also be a result of the makeup of the city and suburbs. Areas closer to the open-air heroin market have higher rates of minorities compared to areas farther away. Therefore, non-white offenders have more opportunities to purchase drugs closer to their home compared to white offenders. Previous research has also found that officers police Black neighborhoods differently than they police white neighborhoods (Gaston, 2019). This could produce further bias in the data and overrepresent Black drug offenders. Differences found by race could be a result of this bias in enforcement.

Unlike previous studies that found repeat offenders traveled farther, the current study

found that repeat offenders traveled significantly shorter distances (Levine & Lee, 2013). There are several possible reasons for this finding. One possibility for this difference is that there are not as many places to purchase drugs in Rochester compared to other communities so those that offend are not able to find a new place farther from their home. Sellers are also not able to travel to new locations since there is only one drug market in the area. It is also possible that repeat offenders are individuals known to law enforcement, so in an effort to reduce their exposure to law enforcement, they stay closer to their home.

In the current study we found that individuals with a co-offender traveled shorter distances compared to those who offended alone. Previous studies investigating the effect of co-offenders found that individuals arrested for drug sales traveled farther distances if they had a co-offender (Levine & Lee, 2013). We initially thought the difference in results could possibly be due to the inclusion of possession offenders in our analysis and that individuals arrested for possession with a co-offender may travel shorter distances. However, about 70% of individuals with a co-offender were arrested for sale and not possession. One possible explanation for why offenders travel shorter distances with a co-offender is that they may not actually be offending with them. It could possibly be an individual purchasing drugs from another individual and they both traveled somewhere relatively close to their house. Another possibility is that sellers are typically traveling less far and since there are more of them that have co-offenders this may skew the data. Future research is needed to determine more about why this finding occurred in our data but not in previous research.

The current study found that individuals who offended within the Project Area, which is the site of an open-air heroin market, traveled shorter distances. We had expected to find that individuals would travel farther to get to these locations based on previous work about deprived

areas (Forsyth et al., 1992). One possible explanation for this is that individuals who live close to the Project Area are able to acquire drugs more often than those who live farther away. Individuals who live far away may only come into the area once a week compared to those who live there could purchase drugs every day. The frequency of trips could result in offenders living close by being arrested more often and skewing the results. Individuals over time may also move to be closer to the Project Area if they are repeatedly using drugs.

There were no significant differences in travel distance for male and female offenders, we had expected that men would travel farther. We did have a very small sample of women which also could have impacted our results. Previous studies on drug offenders for both sale and possession have found that men travel farther (Pettiway, 1995; Levine & Lee, 2013), however some studies have found that this effect is only for cocaine and there is no significant difference for heroin arrests (Johnson, Taylor, & Ratcliffe, 2013). All these studies used different methods and populations therefore it can be difficult to compare across studies. More studies are needed to determine the effects of gender on the drug JTC.

Like gender there were previous mixed findings on the effects of age on the JTC. The broader JTC field has found that juveniles travel shorter distances (Levine & Lee, 2013), yet the one study on JTC for drug offenders did not find a difference (Johnson, Taylor, & Ratcliffe, 2013). We expected to find that juvenile offenders would not travel as far as older offenders, however there were no significant differences between the groups. To test age differences, we used both a correlation and independent samples t-test. While juvenile offenders are typically individuals under 18, the current sample did not have a large enough sample under 18 to be used. As a result, we used individuals under 26 and, like Johnson, Taylor, and Ratcliffe (2013), they also did not find a difference with age. Levine and Lee (2013) had a large enough sample under

18 for all offender types and did find juvenile offenders traveled shorter distances. Levine and Lee (2013) did test an interaction between gender and age specifically for drug seller arrests. Both of these studies found that there is an interaction between age and gender with male juvenile offenders traveling significantly shorter distances (Johnson, Taylor, & Ratcliffe, 2013; Levine & Lee, 2013). Offenders under 18 are likely very different than those 18 to 26 due to access to resources. Individuals under 18 may not be old enough to drive or have access to a car. Those under 18 may be limited to locations where they can walk too. It is quite possible that there are age differences in travel distance that we are unable to test based on the nature of the current sample.

Limitations

One limitation with this study is the data we have available. Data from police departments is biased as not every offender is equally likely to be arrested and a few studies have found there are disparities in policing in different neighborhoods (Gaston, 2019). Based on our own experience with observations and interviews with law enforcement, we know that the police do not make arrests for every drug offense, as that would be impossible. If arrests are not an accurate random sample of all offenders in an area, then the results may not reflect the true travel patterns of offenders. There are several findings in the study that may be a result of biased policing. There are not many other sources available besides policing data to analyze this aspect of offending, however we recognize that policing behavior in certain neighborhoods may cause findings that do not align with reality. Though conducting qualitative studies similar to Forsyth et al. (1992) and Pettiway (1995) could help to address this limitation.

Another limitation that may have affected our results is the strict inclusion criteria for this study. An arrest incident could only be included if it had coordinates for the home and incident

address. Over 2,000 incidents could not be included in the study due to this requirement. In addition, besides the address not having coordinates, the incident location may not necessarily represent where the individual traveled to purchase or sell drugs. It is possible that officers will arrest individuals for some other charge and in the process find drugs on them. They will likely use the location of the incident they initially responded to or witnessed and not the location of the purchase or sale of drugs. In the dataset we have also found that incident locations are often listed at the Public Safety Building or other law enforcement agencies throughout Rochester. These locations may not reflect the actual drug buying incident and just at what point the drug was discovered by an officer or probation officer.

Lastly, the group of interest in this study was non-marijuana offenders yet this may not have been the best group to analyze. Our results differed somewhat from other scholarship in this area. The inclusion of both drug sellers and buyers may have caused many of our results to not reflect previous work and therefore limits the generalizability of our results. Buyers and sellers have different motivations and goals, and their behavior may not be the same. They are likely different types of offenders with different motivations. Had we separated these groups into two different samples and repeated these tests we may find different results.

Future Research

As noted in our limitation section, conducting a future study that considers buyers and sellers as two separate offender types may provide us with results that more accurately reflect what is happening on the ground in communities. These offenders are likely two distinct groups that have different motivations. As a result, any findings from the current study may reflect this combination and not differing behavior in Rochester. To increase the generalizability of our results and our ability to compare this research to previous studies, we intend to repeat the

current analysis dividing by sellers and buyers. This paper will test all of the same hypotheses for each group separately. We hope that this change will allow us to further add to the JTC field for drug offenders. Another possible study we could complete would involve interviewing offenders about these results and see if they can provide further insight into these findings. In addition, we could complete a study that would involve looking at distance traveled by offenders in an area similar to Rochester.

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Appendix A

Category	Included Penal Codes
Non-Marijuana Possession	PL 220.03 - .21 excluding 220.06 04 and 220.16
Non-Marijuana Paraphernalia	PL 220.50 - .72
Non-Marijuana Sale/Intent to Sell	PL 220.16 and 220.31 - .44
Marijuana Sale	PL 221.35 - .55
Marijuana Possession	PL 221.05 - .30 and 220.06 04
DUI Drugs	VTL 1192 - 4 of 4A