2008

Juvenile movement between activity nodes

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JUVENILE MOVEMENT BETWEEN ACTIVITY NODES

A Thesis

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Criminal Justice

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September 2008

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ABSTRACT

Journey to crime pattern literature has predominately focused upon the home address to the offence location. This research addresses an identified gap in the existing literature in relation to juvenile delinquents and the extent their activity nodes contribute to their mobility.

In this thesis, individual level data for 2,563 juvenile delinquents residing in the desert communities of Southern California is examined to identify patterns of distances traveled to juvenile activity nodes. The role of gender, age and ethnicity are investigated as well as the influence of core, peripheral, and isolate residential locations on distances traveled. A methodology is developed utilizing statistical tests and regression equations to analyze the individual level data which is then presented, interpreted and policy implications stated.

The research results establish the differential role of gender, age and ethnicity within the study population. The influence of isolate locations upon juvenile delinquent travel patterns is also established. Significant policy implications are stated both for youth diversion programs and juvenile offender crime pattern analysis methods.

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CHAPTER ONE

INTRODUCTION TO THE STUDY

This research will examine the movements of juvenile delinquents residing in the desert communities of Southern California. It will show that knowing more about juveniles' activity space provides support for juvenile crime prevention initiatives aimed at combating delinquent behavior by strategically deploying intervention/ diversion programming in the areas where they will most likely commit their crimes.

Statement of the Problem

It is important to understand how far the juveniles travel in their daily activities because it is often during these activities that opportunity to commit crimes presents themselves (Agnew & Peterson, 1998; Brantingham, 1995, 1998; Felson, 2002, 2006). Previous research examining offender travel patterns have included juveniles within the samples (see for example Smith et al., 2008; Phillips, 1980; Turner, 1969; Wiles & Costello, 2000), but few have given significant emphasis to them. Those studies that do include juveniles when measuring travel distance to crime sites show that youths do not travel far to commit crimes (Davies & Dale, 1995; Meany, 2004; Smith,

Bond, & Townsley, 2008; Wiles & Costello, 2000; Turner, 1969; Brantingham, 1995, 1998; Felson, 2002, 2006). However, recent findings suggest that important variation in juvenile mobility might be masked by earlier research. For instance, differential access to automobiles (Wiles & Costello, 2000) has been shown to account for substantial variation in travel distance. If the factors related to significant variation in travel distance can be isolated, then adjustments can be made to better calibrate geographic profiling tools.

Purpose of Study

The purpose of the study was to shed light on the distances routinely traveled by juvenile delinquents to reach their activity places, including recreational locations and school. The results of this research can be used to improve future research aimed at generating models to measure juvenile activity and mobility; incorporating a more complete understanding of juvenile delinquents activity places provides a more comprehensive prediction of the offenders' awareness space and potential crime targeting behavior.

The research used juvenile offender data from an ongoing evaluation of a Riverside County, California youth

diversion program. Analysis will be conducted using a range of key demographic variables to examine the variation in distances traveled to individual's activity nodes. The method of transport to these locations will also be examined. Inter and intra city comparative analysis using an ordinal classification of the city of residence (core, peripheral, or isolated city) will test the impact of the geographic proximity in pulling or attracting youth to concentrated recreational activity zones. Finally, analysis will explore the median travel distance (median distance of all travel) to see if they conform to distance decay functions found by prior research.

Summary

The findings will show that there are significant differences between groups of juvenile delinquents living in the Southern California desert communities. It will show that characteristics of the cities in which a juvenile resides can influence how far they travel for school and recreation. It will also show that certain demographic characteristics such as age, gender, and ethnicity, as well as their method of travel will impact

these distances. Explanations for these patterns, as well as suggested policy implications will be considered.

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

Understanding the movement patterns of delinquent juveniles requires the integration of theoretical concepts from Routine Activities Theory and Crime Pattern Theory. Daily activity generates spatial knowledge of areas and brings potential offenders into contact with opportunities. Combined, these theories provide an explanation for the patterns revealed by research measuring the journey to crime. Offenders typically travel less than 2 miles away from their residence to a crime site; however, this findings is based on samples that include few juveniles. Additionally, a range of methodological issues within the studies and their impact on the utility of prior research for use in geographic profiling software will be discussed.

Theoretical Background

Juvenile mobility can be explained by integrating Routine Activities theory (Cohen & Felson, 1979; Eck, 2003; Felson, 2002, 2006) and Crime Pattern Theory (Brantingham & Brantingham, 1981, 1995, 1993, 1998). Routine Activity Theory explains crime events as being the

product of opportunities created by the interactions of key parties of the events. Crime Pattern Theory expands upon these ideas by suggesting that travel between activity locations is influenced by an environmental context produced by design, urban planning, and ones own knowledge of the urban landscape. Supporting evidence of the relevance of these two theories is found in research examining the link between juvenile leisure activity and delinquency.

Routine Activities Theory

Routine activities theory explains the way that criminal offenses are related to the "nature of everyday patterns of social interaction," (Felson, 2002, p. 45). Felson argues that the everyday patterns of our work, social, and residential routines influence convergence spaces in time and place that give potential offenders the opportunity to commit crimes (Felson, 2002; Eck, 2003).

Crime Triangle. According to Felson (2002, 2006), there are six core elements that when combined produce a situation conducive to crime; these elements can be described as the three sides of a crime triangle. The three elements that need to be in place leading up to a crime are "offender, target, and place," (Eck & Clarke, 2007; Felson, 2002, 2006). The other three elements are

tied to the first three. The first of these is the "handler" or person that supervises a potential offender such as parents and teachers (Eck & Clarke, 2007; Felson, 2002, 2006). Then, there is the "guardian" or the people that supervise the potential target. These people could be average citizens passing on the street, or somebody hired specifically to guard a place or item such as a security guard (Felson, 2002, 2006). Lastly, a "place manager" supervises a place (Felson, 2006). These people can be apartment managers or schoolteachers, noting that place managers like school employees would only be supervising during the day (Felson, 2006). When one of these last three components is missing, crime opportunities exist. By incorporating the basis of the Crime Triangle, it is even more possible to understand how people and places impact how and when crime occurs in everyday routines.

Convergence Settings. Felson notes that juveniles often meet in settings such as hangouts, a friends home, video parlors, fast food restaurants, parks, and street corners (2006, p. 98). He further discusses how juveniles have to find legitimate places to converge in order to engage in deviant behaviors. These places are often part of the youth's daily life which enables them to have continual access to these settings. In these convergence

settings, the juvenile who may be an offender will most likely:

- Have substantial time for informal, unstructured activity;
- be exposed to crime opportunities on the spot;
- find accomplices for crime at nearby times and places; and
- be largely insulated from adults or from others who would interfere.

(Felson, 2006, p. 98)

Felson suggests that a lack of supervision, structure, and the influence of peers can have some bearing on the decision making of a potential juvenile delinquent. Consequently, knowing more about the travel patterns and preferred hangout locations of juveniles can help to explain juvenile offending patterns; primary hangouts might be convergence settings, finding and studying these locations might be more useful in accounting for travel to crime locations than simply isolating the journey between home and crime site.

Crime Pattern Theory

Crime Pattern Theory suggests that the locations that an offender selects to commit a crime are not random;

rather, offenders select targets that they learn about as they are traveling between and around locations they frequent regularly (Brantingham, 1995). These travel paths and locations comprise the criminal's "awareness space" stored in a mental image or map of the area. This awareness space is a major factor accounting for an offender's journey to commit crime. Two key features of the cognitive map of an offenders' awareness space are relevant to this research: nodes and paths. The formation of someone's awareness space is also influenced by a range of background or contextual factors referred to as the environmental backcloth.

Nodes and Paths. The nodes are places that a person frequents on a regular basis (Brantingham 1995). For juveniles, the nodes that structure or define their activity space are those locations that juveniles frequent most throughout their daily lives, including school and home, as well as recreation/leisure activities, such as going shopping or to the movies.

Paths represent the route the individual takes between nodes. Due to normal exploration behavior over time, knowledge accumulates about the areas around the most direct paths used. This are is referred to as a 'buffer' area around the route that the individual is

aware of, but may not travel down. Such buffers usually consist of "short and moderate distances," (Felson, 2006, p. 250) of about a half to a quarter mile, which may present opportunities for offending behavior but are not primary destination nodes. Several studies have found that offenders tend to avoid committing crimes in the areas immediately surrounding home despite the likelihood of knowing these areas in great detail (Davies & Dale, 1995; Rengert et al., 1999).

Environmental Backcloth. The environment within which a juvenile functions influences their exposure to crime opportunities. Brantingham and Brantingham describe environmental backcloth or context of ones behavior as being a combination of physical and social surroundings (1998). They suggest that city planning and design help shape this backcloth and that crime is a product of the interaction between a potential offender and the immediate proximal environment (1998). The Brantingham's suggest that transformation from normal routine to criminal events may be a trigger or accidental encounter with environmental cues, which present opportunities to offend. In this way, ones environment may influence their journey to crime.

Leisure Activity

Juveniles, who spend a lot of time engaged in unsupervised leisure activities, are likely to find greater opportunities for offending (Riley, 1987; Agnew & Peterson, 1989, Osgood et al., 1996; Van Vliet, 1983; Kroenman et al., 2004). Additionally, groups of juveniles offend more and travel farther distances to commit those crimes then their single counterparts (Riley, 1987; Agnew & Peterson, 1989, Osgood et al., 1996).

In a study about leisure and delinquency, Agnew and Peterson (1989) found a relationship between delinquency and different types of leisure. The study used data comprising of a sample of high school students in a suburban community in Georgia. They used a random sample of 600 juveniles and a control sample of 600 white students from nationally official school records. The initial sample were interviewed about leisure activities and divided these activities into different categories such as organized, peer oriented, hanging out, sports, and activities with their parents. They asked the juveniles how much time they spent in each of the activities as well as how much they enjoyed the activity. Delinquency was measured with a self-report scale having the youth

identify how many times they had engaged in a particular delinquent act within a specified time frame.

Agnew and Peterson (1989) found that the type of leisure was related to delinquency (p. 343). The "hanging out" category was positively related with the total and serious delinquency, "social" activities was associated with minor delinquency and engaging in activities that were organized and parental had the lowest occurrences of delinquency (p. 343). In addition Agnew and Petersen found that juveniles who spend a lot of time in leisure activities with their peers were more likely to be engaged in delinquent acts (p. 344), concluding that unsupervised peer-oriented leisure may be associated with delinquency because it increases the likelihood of encounters with other deviant juveniles (p. 343).

The implications of what has been found in previous research about juvenile delinquents are that certain characteristics may be particularly important when trying to identify at-risk youth. Commonalities of lack of parental supervision and unsupervised leisure activities can contribute to a juvenile's likelihood to offend.

Juvenile activity nodes are an important component of understanding how offenses can occur within a youth's regularity of daily life (Brantingham, 1998). Lack of

supervision and structure has proven to be a component of a juvenile's likelihood of committing an offense (Felson, 2006; Brantingham, 1995, 1998; Agnew & Peterson, 1989, Turner, 1969) and in keeping with the Routine Activities theory, this lack of responsible authority or capable guardian, may allow juveniles to happen upon criminal opportunities while unsupervised either on their own or in within groups of peers (Felson, 2006, Agnew & Peterson, 1989).

When many different youth share a common activity node, the location may be a convergence setting. Convergence settings are places where people gather and often times are the sites that help set a criminal act in motion (Brantingham, 1995, 1998; Felson, 2002, 2006).

Journey to Crime

Research examining the journey to crime taken by offenders supports the theoretical discussion presented above. It appears that most offenders travel less than 2 miles from home to the crime site location (this travel is also referred to as the crime trip). After reviewing the extant literature studying juvenile offender mobility, the discussion will examine the emerging evidence of inter-community juvenile travel patterns. This section

will finish with a discussion of the methodological limitations impact on the applicability of these findings to account for juvenile mobility.

Juvenile Crime Trips[1] and Distance Decay

Crime distance literature tends to assert that offenders commit crimes close to home and that juvenile's travel a shorter distance than adults (Davies & Dale, 1995; Meany, 2004; Smith, Bond, & Townsley, 2008; Wiles & Costello, 2000; Turner, 1969). Table 1 provides a brief review of some journey to crime literature that includes juveniles in the sample.[2] Since the findings are typical distances for all offenders, it is relevant to extract where possible the distances traveled by juveniles only. A few of the studies reported in Table 1 require attention.

Phillips (1980) found in a study of juvenile criminal offenders that their journey to crime follows a classic distance decay pattern.[3] He also found that there were

[1] To clarify, a crime trip is typically defined as (the distance traveled between home and the place where the crime is committed.

[2] A full literature review matrix (including a comprehensive list of studies sited in this research) is available in Appendix A.

[3] Distance decay is the "spatial interaction" of the effect of distance on the accessibility and number of interactions between locations (ESRI, 1996); locations at a distance are frequented less often then locations nearby. Jourey to crime research has found evidence of a distance decay function showing that in general, offenders commit more crimes closer to home.

trip length variations by offense characteristics such as sex, age, but that race and distance of residence from the central business district were not important determinants.

Wiles and Costello (2000) found that in the city of Sheffield, United Kingdom (considered an urban city) 78.1% of offenders between the age of 10-15 years committing burglary travel less than 2 miles from home to offend, and 50.4% of car crime offenders travel less than 2 miles from the home address to commit offenses.

Wiles and Costello (2000), also report that the failure to find a positive correlation between an offender's journey to crime and their age (pg. 12). The authors believe that this is due to a high level of car ownership and the youth's access to automobiles.

Rebecca Meaney (2004) assessed the difference between commuter and marauder offenders. Meaney's classification of a commuter and marauder, is based on Canter and Larkin's (1993) Marauder/Commuter model that defines a marauder as someone who commits their crimes closer to home (within the offense circle) and a commuter as someone willing to travel farther to commit their crimes (outside the offense circle). Meaney used police data that examined 83 serial criminals with 18 offenders having juvenile

status. Of the juveniles, Meaney found them to be equally distributed between the commuter, and marauder groups.

Research conducted by Andy Brumwell (2007) using police data for the West Midlands, United Kingdom, classified 258,074 crime trips by crime, gender, and age. Brumwell found that young offenders do not travel as far as older offenders, with most traveling under one mile. Although this shows that juveniles do not tend to travel far, the studies overall findings were that half of all offenders included traveled under one mile as well.

A study conducted by Smith, Bond, and Townsley (2008) in a semi-rural area examined 32 burglars over a three-year period. Smith et al. found that the juvenile offenders traveled less than 5 kilometers (3.11 miles). The number of juveniles in the study was 5 out of the 32 total offenders. There was no distinction between genders of the offenders.

The literature review identified relatively low mean distances traveled by offenders across various offence types. Table 1 highlights some findings of selected studies conducted that included juvenile movement in relation to offence locations. The general consensus of the prior journey to crime research is that most criminals are traveling short distances (refer Appendix A). These

findings are in agreement with the theoretical research that concurs that most offenders commit crimes within close proximity to their homes (Rossmo, 1995; Brantingham, 1995, 1998; Felson, 2002, 2006).

Table 1. Sample Literature Findings of Travel Distances by Offence Type (Including Juveniles)

Offense	Author/Year	Typical Distance in Miles	Mean or Median	Country Study Area
Assault	Wiles, Costello (2000)	1.93	mean	UK
Assault	Phillips (1980)	0.7	mean	USA
Auto theft	White (1932)	3.43	mean	USA
Auto theft	Phillips (1980)	1.15	mean	USA
Burglary	White (1932)	1.76	mean	USA
Burglary	Phillips (1980)	1.05	mean	USA
Burglary	Smith, et al (2008)	1.37	median	UK
Disorderly Conduct	Phillips (1980)	1.06	mean	USA
Dom. Burg	Wiles, Costello (2000)	1.88	mean	UK
Drug Off.	Phillips (1980)	1.93	mean	USA
Loitering	Phillips (1980)	1.65	mean	USA
Non-Domes Burg	Wiles, Costello (2000)	1.83	mean	UK
Petty Larceny	Phillips (1980)	2.46	mean	USA
Public Intoxic	Phillips (1980)	1.37	mean	USA
Shoplifting	Wiles, Costello (2000)	2.51	mean	USA
Theft from Vehicle	Wiles, Costello (2000)	1.97	mean	UK
Vandalism	Phillips (1980)	1.31	mean	UK
Various	Brumwell (2007)	50% < 1	mean	UK
Various	Chamard (2007)	1.1	median	USA

Inter-community Travel

Emerging from the literature-exploring journey to crime is a relatively new pattern of inter-city trip migration. If certain sites within a community have the ability to import or attract a large number of offenders then the presence of such magnets should be considered when measuring crime trip lengths. Three studies raise this question.

Wiles and Costello looked at the importing and exporting of offenders in Sheffield, England (2000) into other communities and how this may have some bearing on journey to crime research. They found that over 50% of the offenders in their study who originated in Sheffield, traveled to the near by cities, often committing crimes in those cities. The cities that were most vulnerable were the ones that were closely linked with Sheffield. In addition, the city of Sheffield received offenders from those surrounding cities as well.

Sharon Chamard presented on youth and their journey to crime (WSC, 2007). Her study is based in the neighborhoods of Anchorage, Alaska (core environment). In her analysis of the importation and exportation of serious youthful offenders she found that there is travel in and out of the areas, but the juvenile offenders in her

analysis still are committing most of their crimes close to home (WSC, 2007).

For youth aged 10-17, Chamard (2007) found significant variation by crime type. Using a sample of 660 crime trips, Chamard (2007) found that juveniles residing in traveled a mean distance of about 1.4 miles to commit assault whereas they traveled a mean distance of 2.22 to 2.44 miles to commit a property offence.

Individual Distribution versus Aggregated Patterns

A study by Van Koppen and De Keijser (1997) attempted to test whether or not data collected at the aggregate level was appropriate for journey to crime research. Van Koppen and De Keijser created a hypothetical scenario with one thousand robbery cases and tested the data three different ways. Van Koppen and De Keijser found no distance decay at the individual level, but they did find it at the aggregated level. This led them to believe that the range of operations may be more important that the distance from the home to crime. They concluded that the home is not the best determination of an offender's journey to crime because it does not incorporate an offender's activity space.

In direct contrast to Van Koppen and De Keijser's findings, Rengert, Piquero, and Jones (1999) argued that

aggregate level of data for journey to crime research was completely suitable. They also do not agree that the home is the most reliable way to measure an offender's crime trip, but defend the use of aggregated data based on the use of buffer zones and previously established research. Rengert, Piquero, and Jones site that the data gathered at the individual level, then aggregated, can then provide individual-level predictions (p. 432). This is possible because the data collected develops "aggregate classification models" (p. 432) which in turn can be applied to the individual.

Finally, to further examine this issue, Smith, Bond, and Townsley (2008) use the Van Koppen and De Keijser (1997) study and the Rengert et al. (1999), study as a basis for testing whether or not the aggregated data and the home site are reasonable measurements of an offender's journey to crime. The authors looked at burglaries in Northamptonshire, East Midlands, and United Kingdom. They had police data on 590 burglaries and 32 offenders. The offenders had to have been detected for 10 or more offenses between the years of 2002-2004. An intra-class correlation coefficient (ICC) was used to determine the proportion of journey to crime variability that exists at the offender level. Aggregate crime trip distributions

contained considerable variation which was not evenly distributed among offenders. Individual crime trip patterns differ remarkably in terms of their location in space (central tendency) and their spread to the extent that aggregate distance decay functions appear to be only appropriate for inferring features of the population of crime trips. The estimated ICC showed that two thirds of the journey to crime variation be inherent between offenders, suggesting that the unit of analysis of most relevance is the offender, not individual crime trip. Compared to the population of crime trips taken, there was a greater degree of consistency of distances traveled by individual offenders.

Software for Journey to Crime Analysis

Throughout the world, law enforcement agencies regularly map crime patterns in an effort to better understand offender movements. There are three particular programs that are consistently used by these agencies to analyze journey to crime patterns (Paulsen, 2006). These are Rigel Analyst, CrimeStat, and Dragnet. The differences between the programs generally involve the different types of distance decay mathematical functions used to generate the travel patterns of criminals and the theory behind the

development of the analysis. All are used to map an offender's travel pattern using the home address as the anchor point. The results of the current study may hold important implications for some of this software.

Rigel Analyst

Rigel Analyst was developed using the theoretical basis of the Brantingham's Crime Pattern Theory and developed a "criminal geographic targeting" algorithm (Rossmo 1995, 1998, 1999). Rigel Analyst was developed in order to map patterns found with property crimes.

CrimeStat

CrimeStat uses a crime travel demand model based on travel theory used by transportation planners. Users can describe the distance traveled to commit crimes in one of two ways. The first is by specifying one of five possible distance-decay functions: linear, negative exponential, normal, lognormal, and truncated negative exponential (Levine, 2002). Each function requires different user-specified parameters. The second method involves use of empirical data: CrimeStat computes a distance function based on a data set of origin (offender residence) and destination (crime location) pairs. For either of these two methods, CrimeStat outputs the probability at the

offender's base of operations is in each cell of a user-specified grid (Levine, 2002).

Dragnet

Dragnet allows any type of function to be used to model the distance that offenders travel to commit crimes, (Canter et al, 2000). The software application computes the probability that the offender's base of operations is in each cell of a user-specified grid and displays these probabilities on a two-dimensional map surface. Dragnet is currently unavailable unless it's been received directly from its developer, Dr. David Canter of the University of Liverpool.

Summary

Combining both Routine Activities and Crime Pattern Theory provides the foundation for exploring and understanding juvenile crime opportunities. These opportunities exist within the daily routines of juveniles and their familiarity with their environment. The localized patterns of activity are related to the opportunities to commit crime in accessible locations, which may be convergence zones, without capable guardianship and with suitable targets (Brantingham, 1998; Felson, 2002, 2006).

Prior journey to crime research focuses on the offenders being adult males who live in dense urban environments. This assumption could unfairly bias the distance traveled as well as the mobility of that offender. If an offender lives in a rural environment, their distance traveled may be vastly different than those in an urban environment. Journey to crime research tends to look at an aggregated level of data and generalizes the findings to individual offenders and assumes that distance decay occurs (Rengert et al., 1999).

Research findings have supported the basic assumptions in the prior research and are consistent but may not be completely appropriate in trying to understand the activity nodes of juveniles in rural desert communities. With greater accessibility to automobiles juveniles may be traveling farther than previously assumed and may even be traveling into other communities. It is important to look at the individual's activity trip and primary activity places in order to get a more complete understanding of where the juvenile is actually spending time. This research will explore the range of distances traveled to schools and activity nodes by a range of demographic and built environment variables.

Research Questions

This research will explore a series of fundamental questions to address limitations in prior research on juvenile journey to crime. Factors examined will involve juvenile offenders and their activity space (routines) and how these variables influence their ability to commit crimes. It will also attempt to determine whether certain city characteristics make any difference in distances traveled to nodes by the juvenile offenders. Additionally, the how the juveniles move in between surrounding cities will be examined. Implications about the effect that mobility may have on other communities nearby will be discussed.

The following questions will be tested in the analysis section of this study.

1. Do youth show variation in distances traveled by key characteristics?
2. Is there quantifiable evidence of importing and exporting between cities of the juvenile offenders?
3. How far do juveniles travel to their activity nodes?

Answering these questions will deepen our understanding of juvenile offender mobility. It is

anticipated that the results of the research questions will identify mobility patterns based on different characteristics of juvenile offenders as well as the cities in which they reside and that these patterns will better enable appropriate policy development and future analysis and research.

CHAPTER THREE

METHODOLOGY

Introduction

The intent of this study is not to explain the crimes these juveniles commit and why, but to understand the activity patterns and mobility of juvenile delinquents.

The data is drawn from a multi-year program evaluation of the Youth Accountability Teams operating throughout Riverside County, California. The data is analyzed using a series of statistical tests to assess the variation in distances traveled by selected characteristics of the study population.

By understanding how far the juveniles can travel and by what means, it may be possible to gain perspective on how to develop policies to improve policing or alternative prevention and intervention policies.

Data Source

The research involved the use of secondary data. Information about juvenile activities were amassed from an evaluation of a juvenile delinquent diversion program, called Youth Accountability Teams (YAT), operated by the Riverside County Probation Department, in partnership with

the Riverside County Sheriff's Department, the District Attorney's Office, and community volunteers.

The Youth Accountability Team (YAT) program accepts juveniles who commit an offense at school, and enrolls them into this diversionary program providing they do not have an extensive juvenile probation record. The program involves putting youth on 6-month behavioral contracts administered by probation officers. Children can be referred into the program if they are between the ages of 12 and 17 years old and are considered are at-risk or vulnerable to the influence of drugs, abuse, gang involvement, etc.

This research involved integrated information drawn from the YAT program evaluation with publicly available community information. The sample included juveniles enrolled in the program between the fiscal years of July 1, 2001 through October 1, 2006. Of the 3,871 juveniles participating in the program, geographic data was available on 2,563 of them. These juveniles represent 66.2% of the program youth (Bichler, 2005).

Independent Variables

Phillips (1980) found that there were trip length variations by offender characteristics such as sex, age,

but that race was not an important determinant. These variables were available within the data set obtained for this study, and selected to explore and compare to previous research findings.

Descriptives

The primary independent variables that were tested were gender, ethnicity, age, travel modality, and city classification. Gender is defined as either male or female. Data on ethnicity was classified into the three groups: Latin, African American, and White. Age was collapsed into three category ranges: 10 to 12; 13 to 15; and 16+. The youngest referral to the program was 10 years old and the oldest is 17 years old. The category of 16+ includes those juveniles who would have turned 18 during their contract period.

Method of Travel

The survey completed by the juveniles asked them how they traveled to their recreational destinations (school, hangout, movie, shopping, fast food, and video store) and the data was categorized as their "general mode of transportation." The "sweat" category consists of those juveniles that get around by walking, skateboarding, or bicycles (etc). The "vehicle" category captures those juveniles that generally get around their activity space

in a vehicle, such as a car, whether driven by themselves, a relative, or friend. The "other" category involves a combination of sweat, vehicle, and public transportation.

Community: Core Peripherary Isolate (CPI) Classification

Prior studies have focused on examining the journey to crime in urban areas. This study examines juveniles in 56 California cities most of which would be classified as rural (the U.S. Census, 2002). The cities were classified as core, periphery, or isolate based on the following scores which were calculated for each city.

For all 56 cities, a sum was calculated based on the actual number of liquor stores, shopping malls, fast food outlets, restaurants, movie theatres, video stores and schools. From this sum, a city level commerce and amenities score was created. This variable was then divided by the square mileage of the city providing an amenities density score.

Using a map, adjacent cities were identified based on próximity to other cities and access based upon whether or not there were geographical restrictions such as mountain ranges, expansive deserts (without roads), and large bodies of water. This data created a city-to-city proximity matrix which reported a count of the number of

cities easily accessible from the other cities within the study.

The Core, Periphery, and Isolate (CPI) classification was derived using all three scores. The amenities count and density provided a measure of both the absolute level of availability of commerce/amenities and also a comparative measure of density of the recreational resources within cities. These measures were ranked, and then combined with the city-to-city proximity data using the stated parameters to develop the CPI classification.

- Core city classification is based upon an amenities density score two standard deviations from the mean and commerce and amenities score of greater than two standard deviations from the mean. Core cities have both a comparatively high level and density of commerce and amenities within the study group.
- Peripheral cities do not qualify as Core cities, have at least one adjacent/easily accessible city and either have over 50% of the mean commerce/ accessibility score or are adjacent to a city which has greater than the mean commerce and amenities score.

- Isolate cities do not qualify as Core cities, are physically isolated with no adjacent or easily accessible cities, or have less than 50% of the mean commerce and amenities score and are not adjacent to a city with greater than the mean commerce and amenities score.

The application of the CPI classification to the 56 cites within the study returns 5 core cites, 25 peripheral cites and 26 isolate cites. The full CPI classification is shown in Appendix B.

Dependent Variable: Travel to Activity

Distances between home and activity nodes were measured by qualifying with a minimum of 4 addresses per individual. Activity nodes are defined as being school, primary hang out (juvenile was asked where they spent most of their time away from home), where they get fast food, where they go to the movies, where they shop, and what video stores they patronize. Individuals were chosen for the geographic analysis if they had four valid addresses (with the home address being an absolute requirement). The home address and activity nodes were geocoded for each individual. Using a closest route analysis through the mapping software, ARCGIS, measurements were made for each

individual using the home as the anchor point. Extensive cleaning of the data was undertaken to ensure quality and consistency in the data. For further information on the process, refer to the YAT evaluation report (2005).

Sample Description

The sample juveniles are predominantly Latino (n = 1086) and male (62.6%); although females made up 37.4% of the group. The largest age groups represented are the 13 to 15 year olds (57.5%) traveling primarily in vehicles (64.2%) and living in areas classified as peripheral cities (65.6%). About 62.5% of the juveniles were referred to the YAT program because of a criminal offense. These findings are consistent with the overall program population as seen in Table 2.

Table 2. Variables

VARIABLE	Sample (2,563)	Program Population (3,871)
Gender	(2,508)	(3,871)
Male	62.6	64.3
Female	37.4	35.7
Ethnicity	(1,808)	(2,895)
Latino	60.0	62.4
African American	10.2	11.6
White	29.8	31.2
Age Group	(2,198)	(3,327)
10 to 12	6.5	5.7
13 to 15	57.5	55.8
16 and over	36.0	38.4
Travel Modality	(2,248)	(2,728)
Sweat	28.0	27.6
Vehicle	64.2	64.1
Other	7.8	8.2
City Class	(2,562)	(3,867)
Core	20.7	20.7
Periphery	65.6	64.6
Isolate	13.8	14.7

Summary

The research draws upon data collected through interview and questionnaires in the form of both qualitative and quantitative data and secondary data drawn from standard, nationally comprehensive and consistent sources. These data sets are to be linked using geographical location as the common denominator, with individual juvenile records being appended with location.

The following chapter provides details of the results and findings of the analysis in pursuance of answers to the stated research questions.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

Using the juvenile activity data available, analysis of the four research questions was undertaken. The aim was to describe juvenile travel patterns through association with the selected discriminating variables. This chapter will present the analysis undertaken and the results obtained.

Research Question 1

The research question posed was; do youth show variation in distances traveled by key characteristics? Due to the breadth of prior research in this area it was possible to construct several research hypotheses. Table 3 details the hypothesis that will be tested in the analysis.

Table 3. Research Hypothesis for Question 1

Variable	Null	Research
Gender	There is no difference in the median distances traveled by gender.	There is a statistically significant difference in the median distance traveled by gender.
Age Groups	There is no difference in the median distances traveled by age groups.	There is a statistically significant difference in the median distance traveled by age groups.
Ethnicity	There is no difference in the median distances traveled by ethnicity.	There is a statistically significant difference in the median distance traveled by ethnicity.
Method of Transport	There is no difference in the median distances traveled by mode transport class.	There is a statistically significant difference in the median distances traveled by method of transport class.
City of Residence	There is no difference in the median distances traveled by City group class.	There is a statistically significant difference in the median distances traveled by City group class.

Gender

Gender was suggested to be an important factor in accounting for variation in explaining juvenile behavior (Brumwell, 2007). The median distance traveled by males was 2.82 miles (n = 1,571) whereas, females traveled 2.93 miles (n = 937). As seen in Figure 1, the distribution of travel distances appear to be similar between genders with a few minor disparities.

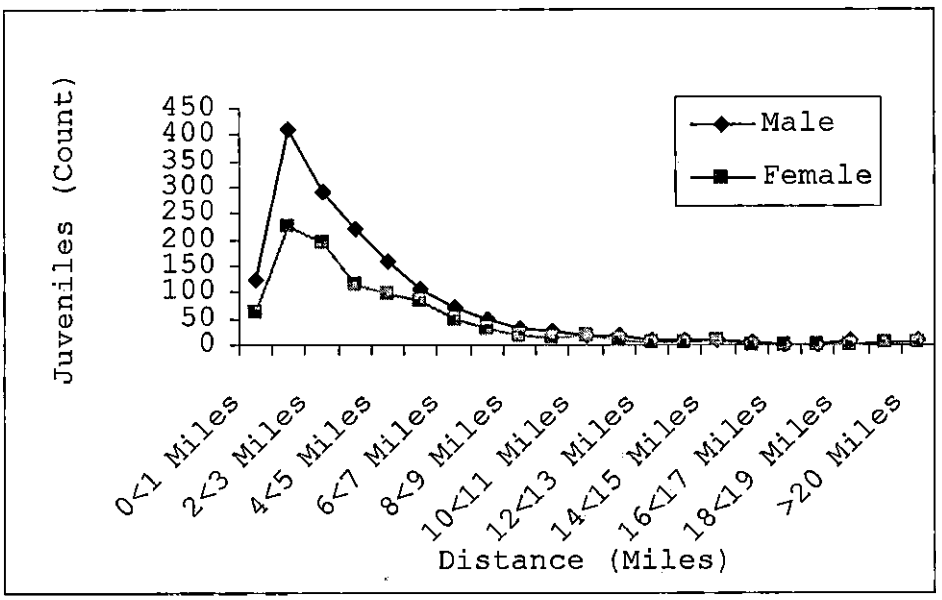

Figure 1. Median Distance Traveled by Gender

Statistical significance in the observed variation in median distances traveled across the Gender classes was examined with a Mann-Whitney U test (a non parametric analysis of variance of median distance ranks). The Mann-Whitney analysis reported in Table 4 reveals significant differences in the distances traveled. The test statistic reported is a 2-tailed test statistic and therefore as the hypothesis tested requires a 1 tailed test the resulting significance figure (.073) needs to be divided by 2. The resulting significance level of .037 represents a statistically significant test result at the pre-designated significance threshold of .05, therefore the null hypothesis can be rejected and the research

hypothesis that there is a statistically significant difference in the distribution of the median distances traveled by gender division with females traveling greater distances can be accepted.

Table 4. Median Distance by Gender

Characteristic	Median	N	Mean Rank	Mann-Whitney U	Z	Sig.
Gender		(2,508)		704564.5	-1.79	.073
Male	2.82	1,571	1234.48			
Female	2.93	937	1288.06			

Age

Age is important as previous research surmises that younger juveniles do not travel as far as older juveniles (Smith, Bond, & Townsley, 2008; Brantingham, 1995, 1998; Felson, 2002, 2006; Rossmo, 1993). Figure 2, presents the observed variations between three age groups.

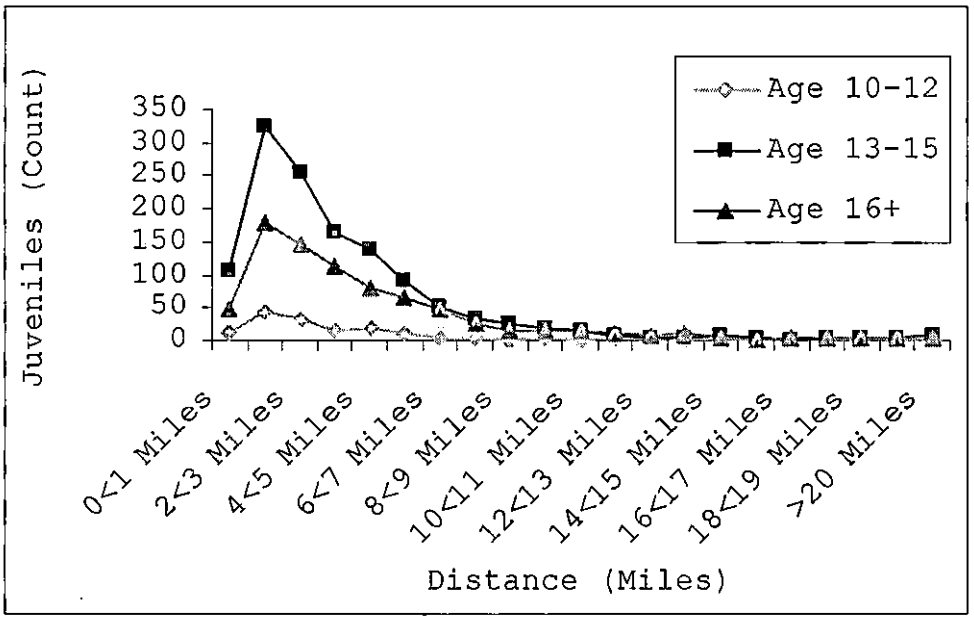

Figure 2. Median Distance Traveled by Age

By plotting the percent of youth traveling different median distances, Figure 2, illustrates that there are no radical differences in the frequency distribution by age group. There seems to be the most variation at the 2 < 3-mile point between all age groups. For the age group 10-12 there is a peak in distance traveled at the 2 < 3-mile point. Both age 13-15 and 16+ have similar distributions with the 13-15 year olds traveling slightly farther at the 2 < 3-mile point.

Although Figure 2 shows little variation, Table 5 shows the test results, with the median distances traveled increasing slightly as age group increases. The Kruskal-Wallis test results report a significant variation

in the median distance traveled by age group therefore the null hypothesis can be rejected and the research hypothesis that there is a statistically significant difference in the distribution of the median distances traveled by age group can be accepted.

In order to examine the individual paired variation across the Age Group classes a Mann Whitney test was conducted for each pair of Age Group classes. Youth 16 & over have significantly different distances traveled than the 10-12 year olds (Mann-Whitney U value of 48475.0; $z = -2.743$, $p < .01$) and the 13-15 year olds (Mann-Whitney U value of 449531.5; $z = -3.867$; $p < .001$).

Table 5. Median Distance Traveled by Age, Ethnicity, and Method

Characteristic	Median	N	Mean Rank	Kruskal-Wallis X^2	df	Sig.
Age		(2,198)		17.592	2	.000
10-12	2.38	143	1,016.67			
13-15	2.70	1,263	1,062.35			
16 & Over	3.08	792	1,173.70			
Ethnicity		(1,808)		10.634	2	.005
Latino	2.85	1,086	879.02			
White	3.00	538	965.99			
African American	2.84	184	875.11			
Travel		(2,248)		108.735	2	.000
Sweat	2.02	630	895.77			
Private Auto	3.20	1,443	1214.67			
Other	3.25	175	1204.38			

Ethnicity

Previous research (Turner, 1969; Wiles & Costello, 2000) indicates that there is little evidence that ethnicity is a significant factor in the distances traveled to crime by juveniles. The ethnic structure of the study population and the possible associated cultural influences were considered to be potentially important and therefore included within the analysis. Figure 3, show the observed variation.

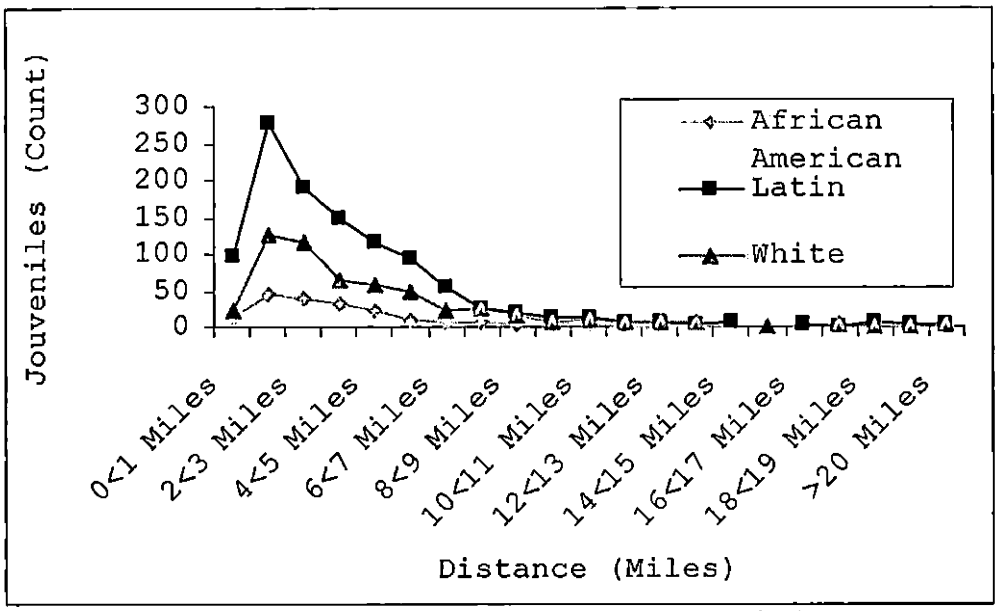

Figure 3. Median Distance Traveled by Ethnicity

By plotting ethnicity cohorts by the % median distance traveled, Figure 3, it is evident that there is a similar variation in the distribution of the distances traveled across ethnicity class. However, it is not immediately clear within that variation which ethnicity cohort is associated with greater distances traveled. There is slight variation between all three groups at the 4 < 5-mile range with white and Latin youth traveling less distance than African Americans. The variation changes again at the 6 < 7-mile range where African Americans travel roughly 4-miles less than white and Latin youth. The variation then stabilizes with the greater distances until the 18 < 19-mile range with African American youth

seem to stop just past this point, while white and Latin youth maximize their distances past the 20-mile point.

Table 5 shows the test results, with the ethnicity class mean rank of median distances traveled reported as increasing slightly between African American and Latin, and then a greater increase between Latin and European. The Kruskal-Wallis test results report a significant variation in the median distance traveled by ethnic class, therefore the null hypothesis can be rejected and the research hypothesis that there is a statistically significant difference in the distribution of the median distances traveled by ethnic class can be accepted.

Statistical significance in the observed variation in median distances traveled by ethnic classes was also examined with a Mann-Whitney U test. This test reported statistical significance between the groups African American and White youth (Mann-Whitney U = 44526.5; $z = -2.035$; $p < .001$) and between Latin and White youth (Mann-Whitney U = 264022.5; $z = -3.160$; $p < .001$).

Method of Travel

Method of travel information was used to explore the potential relationships between the distances traveled by the juveniles and the available/chosen mode of transport utilized to undertake those journeys. Figure 4 shows the

highest number of juveniles using private vehicles to travel to their activity nodes, followed by non motorized "sweat" as the second highest class of transport, with other transport showing a much lower frequency of use within the sample population. There are similarities in variation within the distribution of the distances traveled across all modes of transport. It is not immediately clear within that variation if any method of transport is associated with greater distances traveled.

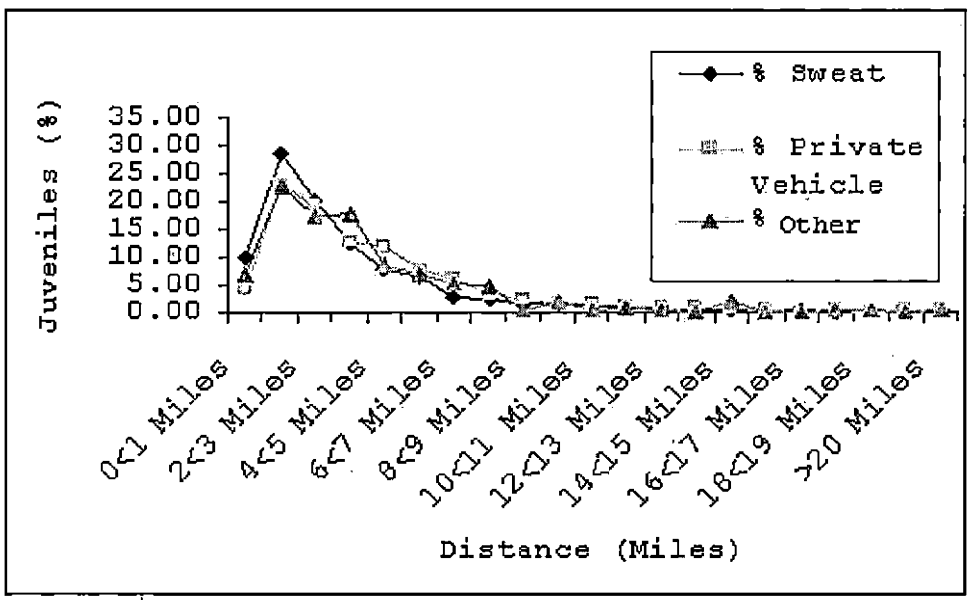

Figure 4. Median Distances Traveled by Method

Wiles and Costello (2000) found evidence that 50% of offenders traveled to nearby cities and that the most vulnerable cities were the ones most adjacent to the

offender's home. Wiles and Costello also indicated that the importation and exportation of not only offenders, but non-offenders, focus around shopping districts and leisure activities (2000, p. 40).

In order to test for statistical significance in the observed variation in median distances traveled across the method of transport classes/groups a Kruskal-Wallis was utilized. Table 5 shows the test results, with the median distances reported as 'sweat' being the shortest median distance traveled by individuals at 2.02-miles, with vehicle and other reported at 3.2 and 3.25-miles respectively. The Kruskal-Wallis test results report a significant variation in the median distance traveled by method of transport, therefore the null hypothesis can be rejected and the research hypothesis that there is a statistically significant difference in the distribution of the median distances traveled by method of transport class can be accepted.

The Mann-Whitney results showed that there was significant differences between the median distances traveled by sweat and vehicle categories (Mann-Whitey U value is 325406.5; $z = -10.303$; $p < .001$) and also between the sweat and other categories (Mann-Whitey U value is

40163.0; z = -5.498; p < .001). There was no significant difference between the vehicle and other categories.

City Classification

A box plot was generated for median distance traveled by CPI classification as seen in Figure 5. The plot shows core cities having the lowest range and smallest inter-quartile range of median distances traveled, with periphery cities having a similar median but greater range and inter-quartile range. Isolate cities display a much higher range of median distances, median value and inert-quartile range than both core and peripheral cities.

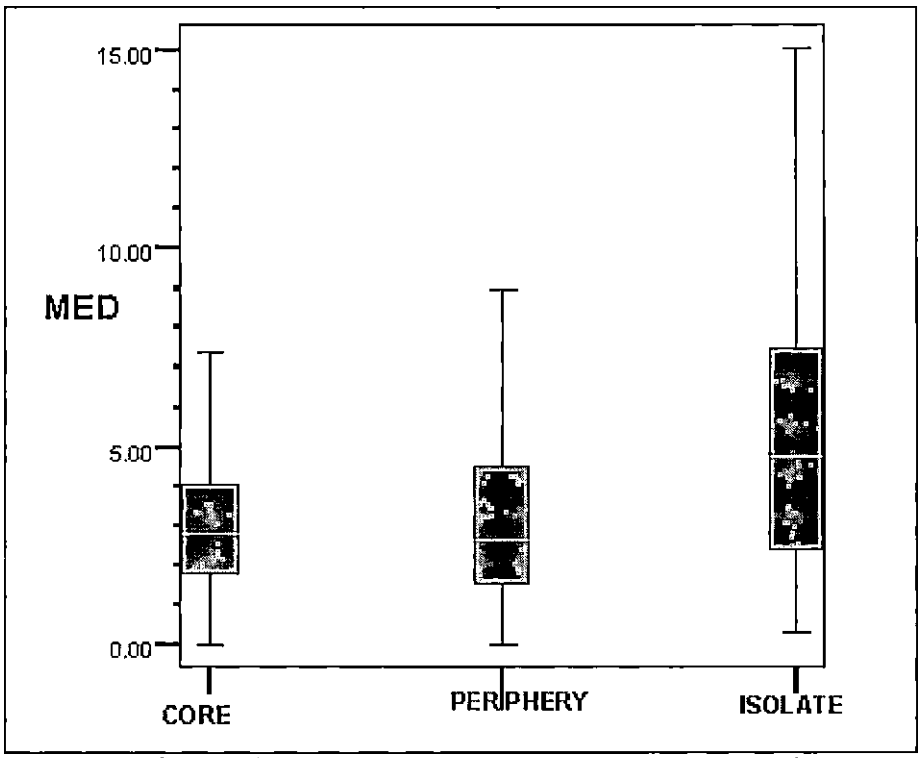

Figure 5. Median Distance Traveled by Core Peripherary Isolate Classification

Youth residing in periphery cities show the shortest median distance traveled (2.65 miles), with "core" reporting slightly longer medians (2.8 miles) and "isolate" the greatest median distance traveled by individuals 5.00 miles. The Kruskal-Wallis test results report a significant variation in the Median distance traveled by city class, therefore the null hypothesis can be rejected and the research hypothesis that there is a statistically significant difference in the distribution

of the median distances traveled by city class can be accepted (Table 6).

Table 6. Individual Trip Variation in Median Distance Traveled

City Class	*Median*	*N (2,562)*	*Mean Rank*	*Kruskal-Wallis X^2*	*df*	*Sig.*
Core	2.80	531	868.05	128.382	2	.000
Periphery	2.65	1,678	865.52			
Isolate	5.00	353	1,207.69			

In order to examine the individual paired variation across the City classification a Mann Whitney test was conducted for each pair of City classes. Significant differences were found between the youth residing in isolated cities compared with youth residing in a periphery city (Mann-Whitney U value is 187922.5; $z = -10.808$; $p < .001$) or a core city (Mann-Whitey U value is 55744.0; $z = -10.214$; $p < .001$).

Research Question 2

The second research question to be considered relates to the level of juvenile activity undertaken by individuals within their city of residence and the levels of comparative import and export of juveniles between cities. Regions were created by using adjacent city

information previously used to develop the database for the core, periphery, and isolate classifications (see Figure 6).

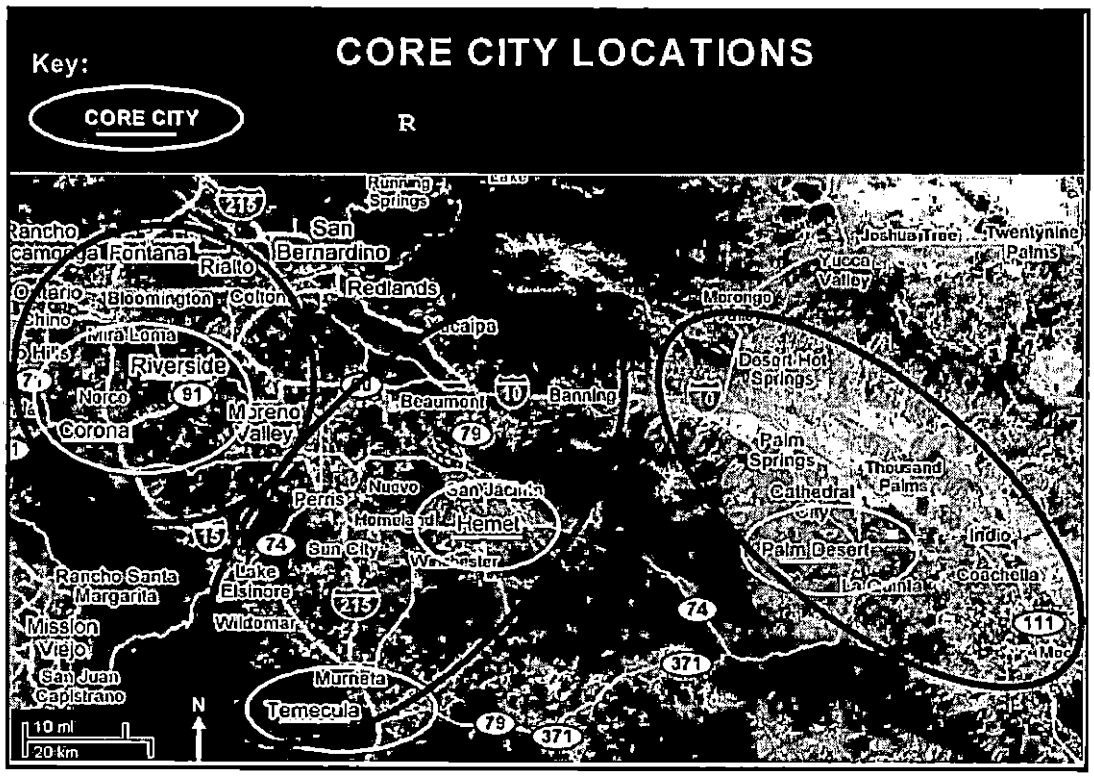

Figure 6. Illustration of Regions based on Core Peripherary Isolate Classification

Cities were grouped based on their geographical proximity to each other. Cities with less than ten juveniles were not included in the regional classification (n = 28). This resulted in the isolated cities being dropped from Regions 2 and 3. The question proposed by the

research examined whether there was quantifiable evidence of importing and exporting between cities of the juveniles.

The use of the regional sub-division of the cities enables comparison of the cities within the natural geographical grouping of the locations. Tables 7, 9, and 10, provide details of the level of resident juvenile activity and imported juvenile activity at the individual city level across the three regions respectively.

Table 7 reveals that Palm Desert, which is a core city for youth attractors and amenities, has a total average of 56.2% of the youth from that city that engage in activities within the city. By contrast, youth who reside in Desert Hot Springs (a peripheral city) has a high percentage of youth who stay within their home city for their activity and recreational sites (95.8%). Another interesting fluctuation in local activity takes place within the city of Rancho Mirage. As a peripheral city, only 4% of their local youth remain in Rancho Mirage when engaging in recreational pursuits. Nearly 98% (n = 323) of those that go to the movie theater in Rancho Mirage are coming from 16 different cities. Table 8, reveals what cities those juveniles are being imported from.

Table 7. Region 1: Percentage of Local Youth Activity

	CITY	SCHOOL	HANGOUT	FAST FOOD	MOVIE	VIDEO	SHOP	AVG % LOCAL
C	Palm Desert	84.1 (n=90)	47.0 (n=40)	74.2 (n=114)	35.2 (n=88)	81.8 (n=78)	14.9 (n=614)	56.2
P	Cathedral City	80.4 (n=317)	74.6 (n=63)	85.0 (n=214)	43.3 (n=367)	75.8 (n=224)	51.6 (n=93)	55.6
P	Coachella	95.3 (n=64)	88.2 (n=34)	77.1 (n=92)	---	74.4 (n=90)	36.0 (n=25)	74.2
P	Desert Hot Springs	97.6 (n=168)	97.2 (n=36)	96.8 (n=126)	---	98.5 (n=138)	88.8 (n=18)	95.8
P	Indio	91.7 (n=146)	84.3 (n=64)	62.1 (n=256)	41.1 (n=299)	70.6 (n=174)	34.1 (n=193)	64.0
P	Palm Springs	68.2 (n=252)	90.0 (n=60)	82.7 (n=139)	67.7 (n=62)	95.6 (n=92)	52.3 (n=126)	67.8
P	Rancho Mirage	---	9.7 (n=41)	0 (n=8)	2.16 (n=323)	---	---	4.0
I	Blythe	98.1 (n=108)	100 (n=26)	97.7 (n=44)	98.3 (n=62)	96.0 (n=50)	87.5 (n=16)	96.2
I	La Quinta	69.4 (n=203)	80.0 (n=35)	92.3 (n=88)	---	76.1 (n=105)	20.0 (n=40)	67.6
I	Mecca	100 (n=1)	100 (n=9)	92.3 (n=13)	---	---	---	97.4
I	Thermal	25.0 (n=228)	77.7 (n=9)	100 (n=2)	---	---	---	67.6
I	Thousand Palms	---	75.0 (n=4)	52.5 (n=40)	---	---	---	63.8

Table 8. Home Cities of Juveniles Traveling to the Rancho Mirage Movie Theater

Home City of Juveniles	Number Exported (n = 323)
BERMUDA DUNES	11
CATHEDRAL CITY	36
COACHELLA	11
CORONA	1
DESERT HOT SPRINGS	41
INDIO	36
LA QUINTA	61
MECCA	4
MOUNTAIN CENTER	1
PALM DESERT	84
PALM SPRINGS	13
QUAIL VALLEY	1
RANCHO MIRAGE	7
THERMAL	1
THOUSAND PALMS	15
BERMUDA DUNES	11

In region 2 (see Table 9), cities such as Beaumont and Perris have a fairly high percentage of local youth activity, yet Hemet and Temecula which are core cities with high amenity scores, have a lower percentage of youth that stay within their home cities for their recreational endeavors.

Table 9. Region 2: Percentage of Local Youth Activity

CITY		SCHOOL	HANGOUT	FAST FOOD	MOVIE	VIDEO	SHOP	AVG % LOCAL
C	Hemet	93.3 (n=90)	77.5 (n=40)	81.6 (n=114)	79.5 (n=88)	75.6 (n=78)	39.6 (n=144)	74.5
	Temecula	87.8 (n=148)	74.7 (n=87)	92.4 (n=131)	55.6 (n=205)	94.5 (n=109)	43.9 (n=253)	74.8
P	Banning	94.4 (n=36)	---	19.0 (n=21)	14.6 (n=48)	75.0 (n=4)	9.1 (n=11)	42.4
	Beaumont	85.8 (n=127)	100 (n=21)	88.7 (n=53)	---	92.6 (n=54)	100 (n=2)	93.4
	Lake Elsinore	83.8 (n=99)	89.7 (n=29)	83.1 (n=83)	100 (n=3)	85.9 (n=64)	46.7 (n=45)	81.5
	Murrieta	0 (n=10)	16.7 (n=6)	62.5 (n=8)	3.2 (n=62)	45.5 (n=11)	0 (n=6)	21.3
	Perris	81.5 (n=356)	90.8 (n=119)	94.8 (n=291)	87.7 (n=261)	95.1 (n=185)	81.2 (n=149)	88.5
	San Jacinto	85.3 (n=191)	94.9 (n=39)	86.6 (n=134)	84.8 (n=112)	87.2 (n=102)	63.1 (n=38)	83.7
	Menifee	43.8 (n=48)	77.8 (n=9)	71.4 (n=28)	---	50 (n=4)	80.0 (n=5)	64.6
	Sun City	---	80.0 (n=10)	61.5 (n=26)	---	40.0 (n=35)	0 (n=2)	45.4

Region 3 (see Table 10) also shows variation between different cities. Corona and Riverside are both core cities in this region; however Temecula has a higher percentage of youth that stay local than Riverside (97% versus 53%).

Table 10. Region 3: Percentage of Local Youth Activity

CITY		SCHOOL	HANGOUT	FAST FOOD	MOVIE	VIDEO	SHOP	AVG % LOCAL
C	Corona	99.2 (n=258)	91.8 (n=73)	98.9 (n=184)	92.6 (n=176)	100 (n=149)	98.2 (n=57)	97.0
C	Riverside	47.2 (n=108)	42.1 (n=38)	75.6 (n=41)	59.6 (n=52)	74.3 (n=39)	16.6 (n=145)	53.0
P	Mira Loma	33.3 (n=33)	50 (n=2)	91.7 (n=12)	---	57.1 (n=7)	100 (n=1)	66.4
P	Moreno Valley	71.4 (n=377)	85.6 (n=83)	92.4 (n=170)	94.4 (n=89)	80.5 (n=159)	43.6 (n=307)	78.0
P	Norco	51.9 (n=27)	66.7 (n=6)	63.1 (n=19)	---	100 (n=8)	71.4 (n=7)	70.6
P	Wildomar	---	0 (n=5)	100 (n=15)	---	100 (n=3)	---	66.7

The extent to which the juveniles undertake activities within their city of residence displays a high level of variation across cities and within cities when examining activity type. The results report a range of average % local activity within cities from 0% (which is likely to be associated with an absence of service within the city, e.g. no school) and 100% (which is associated with small numbers of juveniles within intra-city activity sub categories). The median percent local activity across the cities is 67.7%, which relates to a 32.3% median level of import/export of juveniles to participate in activities outside of their city of residence. The potential range of complex inter-relationships between access to services, transport and issues of choice for the juveniles in the

study restricts exploration of the causal factors in the observed distributions, however it is possible to examine the potential variation in import and export of juveniles in relation to the city classification developed within this thesis.

Using city type (core, periphery, isolate), as the independent variable, and the average percent local youth using the activity locations as the dependent variable, it is possible to test for significant differences between cities in the variation of an imported youth (hanging around). The hypotheses to be tested are stated as follows:

Null hypothesis is that there is no statistically significant difference in the distribution of the average % local activity by City group class. Research hypothesis is that there is a statistically significant difference in the distribution of the average % local activity by City group class.

Table 11 shows the Kruskal-Wallis test results and reports that there is no significant variation in the average % local activity by city group class; therefore the null hypothesis is accepted that there is no statistically significant difference in the distribution of the average % local activity by city group class.

Exploration of the individual paired variation across the city classification using a Mann Whitney test for each pair of city classes did not find any significant results.

Table 11. Variation between City Class for Average Percentage Local Youth Activity

% Local	N (28)	*Mean Rank*	*Kruskal-Wallis* X^2	*df*	Sig.
Core	5	15.20	1.170	2	.557
Periphery	18	13.39			
Isolate	5	17.80			

Research Question 3

In order to examine how far juveniles travel to their activity nodes, median travel distances for each youth were grouped into 1-mile ranges of distance traveled across the range of values recorded. Table 12 presents the distribution of median distances traveled from home to all activity nodes by the juveniles, along with the cumulative percentage of juveniles as the distance traveled increases from 0.

Table 12. Median Distance Traveled to All Activity Nodes

Median Distance in Miles	Percentage (n = 2563)	Cumulative %
0<1	7.3 (188)	7.3
1<2	25.2 (646)	32.5
2<3	19.3 (494)	51.8
3<4	13.3 (340)	65.1
4<5	10.4 (266)	75.5
5<6	7.3 (188)	82.8
6<7	4.8 (122)	87.6
7<8	3.2 (82)	90.8
8<9	1.8 (47)	92.6
9<10	1.4 (37)	94
10<11	1.4 (36)	95.4
11<12	1.1 (27)	96.5
12<13	0.6 (16)	97.1
13<14	0.6 (16)	97.7
14<15	0.7 (19)	98.5
15<16	0.2 (6)	98.7
16<17	0.1 (3)	98.8
17<18	0.2 (5)	99.0
18<19	0.3 (8)	99.3
19<20	0.2 (5)	99.5
>20	0.5 (12)	100.0

The results show that over 50% of the study population travels a median distance of less than 3 miles from home to all activity nodes and 75% travel under 5 miles. The individual class with the highest number of

juveniles is 1 < 2 miles containing 25.2% (646 juveniles) of the study population. The results also show that there is a 1-mile buffer around the residential address to the activity sites that is prevalent with nearly 93% of the juveniles.

A line of best fit was then calculated and plotted for each variable and the regression equation describing the line specified. Figure 7 illustrates the process, resulting logarithmic trend line and the calculated regression equation for that line.

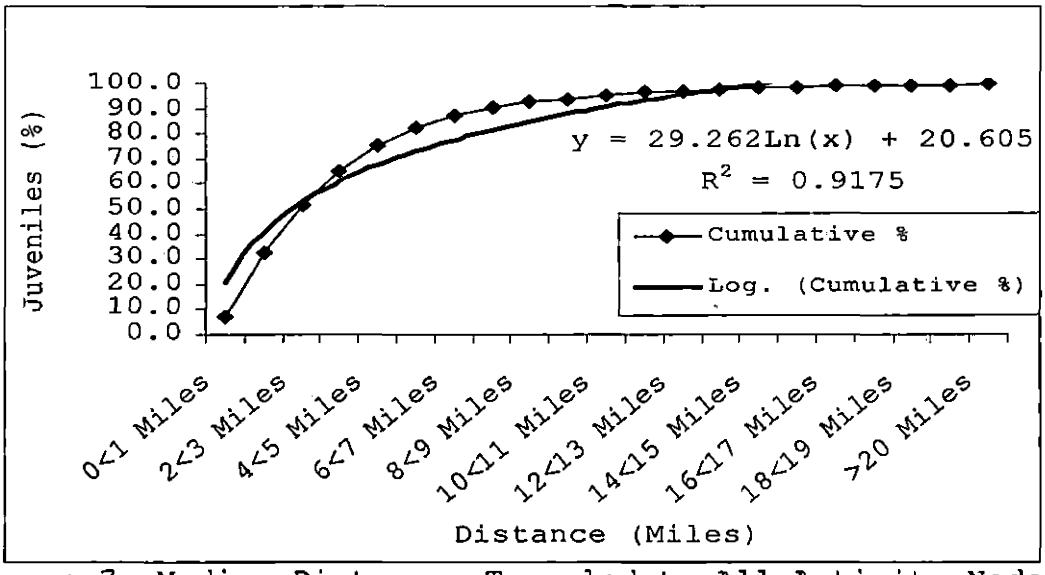

Figure 7. Median Distances Traveled to All Activity Nodes: Logarithmic Trend Line

The logarithmic trend line was identified as the best fit for the data. The data exhibits a high proportion of

juveniles traveling relatively shorter distances with rate of change in the data increasing quickly and then leveling out as fewer juveniles travel relatively greater distances. The trend line in Figure 8 reports a coefficient of determination R^2 value of 0.9175 representing a relatively good fit of the line to the data, explaining 91% of the observed variation in Median distance traveled.

The variables identifying and classifying the individual cohorts of juveniles in terms of gender, age, ethnicity and city of residence type were then examined using the same methodology, the charts were generated, a line of best fit identified and the regression equation and R^2 values calculated and recorded. The results are listed in Table 12.

The results shown in Table 13, show that all the variables identifying and classifying the individual cohorts of juveniles in terms of gender, age, ethnicity and city of residence type conform to a positive logarithmic trend line with a high proportion of juveniles traveling relatively shorter distances with rate of change in the data increasing quickly and then leveling out as fewer juveniles travel relatively greater distances.

Table 13. Median Distance Traveled To All Activity Locations: Logarithmic Cumulative Percentage Comparison

CHARACTERISTICS		REGRESION EQUATION	R^2 VALUE
Overall Distance		y = 29.262Ln(x) + 20.605	0.918
Community	Isolate	y = 35.175Ln(x) - 2.7898	0.972
	Periphery	y = 28.245Ln(x) + 24.153	0.901
	Core	y = 28.588Ln(x) + 25.003	0.843
Gender	Male	y = 28.815Ln(x) + 22.076	0.913
	Female	y = 29.923Ln(x) + 18.779	0.918
Age	10-12	y = 27.721Ln(x) + 26.176	0.875
	13-15	y = 28.464Ln(x) + 23.138	0.900
	16+	y = 30.7Ln(x) + 15.963	0.937
Ethnicity	African-American	y = 28.776Ln(x) + 22.728	0.881
	Latin	y = 28.716Ln(x) + 22.652	0.905
	European	y = 31.147Ln(x) + 15.485	0.927
Method of Travel	Sweat	y = 26.837Ln(x) + 27.652	0.894
	Private Vehicle	y = 31.106Ln(x) + 15.288	0.930
	Other	y = 29.838Ln(x) + 18.842	0.917

The performance of the trend lines and regression equations calculated is relatively good for all the variables, with a range from a low of 0.8425 (for median distance traveled to hangouts by juveniles residing in cities classified as core) to a high of 0.9719 (for median distance traveled to all activity nodes by juveniles residing in cities classified as isolate).

Summary

The analysis presented in this chapter has addressed three research questions. Through analysis, significant findings were made with most of the independent variables tested such as gender, age, ethnicity, and travel modality, as well as city classification. The following chapter is structured around those research questions and drawing upon the literature review, discusses the findings of the analysis.

CHAPTER FIVE

DISCUSSION

Introduction

Understanding more about juvenile travel patterns will generate activity site/location specific policy implications relating to resource allocation. Juveniles often meet and spend significant amounts of free time in places with limited adult supervision , which include a friends home, video parlors, fast food restaurants, parks, and street corners(Felson, 2006, p. 98), where they are more likely to get into trouble(Osgood et al., 1996; Agnew & Peterson, 1989). Developing a more complete description of the factors influencing youth activity patterns, including the distances traveled by juveniles to such hangout locations, provides a basis for targeting diversion programming. The following section explores the research findings in relation to the questions posed and the associated policy implications.

Discussion of Findings

Through prior research, certain demographic variables have been thought to be of importance when understanding the behavior of juvenile delinquents. Research has consistently looked at the age and gender of juvenile

delinquents (Brantingham, 1995, 1998; Felson, 2002, 2006) as well as their mobility (Wiles & Costello, 2000; Peterson & Agnew, 1989. It is through these variables that an understanding of juvenile offender mobility patterns emerged.

Research Question 1

Research question 1 asked whether or not the juveniles showed variation in distances traveled by key characteristics (gender, age, ethnicity, travel modality, and city class). Research has consistently looked at the age and gender of juvenile delinquents (Brantingham, 1995, 1998; Brumwell, 2007; Felson, 2002, 2006) as well as their ethnicity and method of transport (Phillips, 1980; Wiles & Costello, 2000; Peterson & Agnew, 1989; Turner, 1969).

Gender. Where some studies have found no real distinctions between gender and distances traveled (Smith, Bond, & Townsley, 2008; Wiles & Costello, 2000, Peterson & Agnew, 1989), Andy Brumwell (2007) suggests that any variation between genders could be attributed to crime specific factors. For example, Brumwell suggests that females are more likely to engage in shoplifting, which forces them to move to other shopping centers in order to avoid being recognized by store employees (2007).

These findings have observed patterns of travel that appear to be similar although the analysis shows that there is a statistically significant difference in the median distances traveled by individuals by gender division, with females traveling further than males to hangouts. This may be similar to Brumwell's findings as the juvenile females in this study, may tend to go to go to locations involving shopping more often than boys.

Age. The findings are consistent with previous research which reports that distance traveled by juvenile's increases with age (Osgood et al., 1996; Felson, 2003, 2006; Wiles & Costello, 2000; Agnew & Peterson, 1989; Kent et al., 2004; Van Vliet, 1983; Rengert et al., 1999). These results are most likely the same as previous research because there are certain age-related thresholds in life that coincide with independence such as getting a driver's licenses and being afforded greater autonomy from the family (Wiles & Costello, 2000).

Ethnicity. There is noticeable difference is the variation of the distances traveled by ethnic groups.

The results of the analysis are different to prior journey to crime research which has found no significance between different ethnicities and travel distances (Clarke

& Eck, 2002; Turner, 1969). It is apparent from the results that there may be a more localized youth culture within the African American and Latin groups which may be associated with population distributions in relation to the amenities classes used within this study. In other words, the White study population may live in peripheral areas more distant from the activity locations than the other ethnic classes.

The use of key characteristics further enhances the ability to discriminate between specific juvenile groups.

Method of Travel. Wiles and Costello (2000) asserted that juveniles have greater access to automobiles and therefore are able to travel further. The findings here reflect this premise as delinquents utilizing vehicles traveled greater distances. This may be due to the high temperatures and sprawling nature of the communities within this region, necessitating increased distances traveled in private vehicles.

City Classification. It has been suggested throughout the literature that juveniles are attracted to certain convergence points (Felson, 2003, 2006; Brantingham, 1998; Rengert et al., 1999) and that they are willing to go outside their home neighborhoods to engage in leisure activity. Isolate cities have the lowest availability of

amenities, which in turn may influence a juvenile's decision to travel outside of their city of residence. The lack of difference between the core and peripheral cities within the classification is possibly indicative of an amenities threshold which may govern the juvenile's decision making process in relation to traveling. Core and peripheral city juveniles are less likely to bypass existing intra-city recreational amenities with the exception of the transient popularity of specific inter-city teenage venues/attractors. This is important because much the research does not consider the characteristics of the cities or the traveling between these cities.

Implications. Research has shown that punitive efforts do not necessarily ensure that a juvenile delinquent will not re-offend after going through the juvenile justice system (Levitt, 1998; Rees, 2005). It has been suggested that juveniles are more likely to positively respond to incentives and informal sanctions outside of the mainstream youth justice system (Rees, 2005; Jacob, 2006). Within the study area location, there are good examples of such programs run by the county. The YAT and initiative is designed to divert youths from offending behaviors and keep at-risk youth out of the

formal juvenile justice system process. Prevention through diversion, education, intervention is likely to be a cost effective way to achieve long-term individual and societal benefits.

From the findings of this study, it is clear that different groups of juveniles have different travel and activity patterns. Therefore, it is useful to incorporate these findings within programs such as YAT in order to better meet the needs of these juveniles. If older juveniles have greater access to vehicles and travel farther distances than younger juveniles, it may be appropriate for programs such as YAT to tailor contracts to suit the specific characteristics of the juvenile.

Limitations. Peer influences seem to play a role in not only the distances traveled by youth (Turner, 1969; Wiles & Costello, 2000) but also increase the likelihood a juvenile will offend (Felson, 2006; Brantingham, 1998; Agnew & Peterson, 1998; Wiles & Costello, 2000). The YAT data utilized for this study did not have any variables that described whether or not the juveniles in the program were going to their activity nodes alone or with friends. When capturing this information, it would be prudent to also include the number of friends they are engaging in activity with.

Summary. Several demographic characteristics have shown to have a role in a juvenile's decision-making process or ability to travel. Whether it is specific cohorts such as age and gender, or the type of city that they live in, the activities that the juvenile engages in based on these characteristics have proven to be an important determinant in the median distances they are traveling.

Research Question 2

Movement of delinquents between cities has been identified as a significant component in previous studies (Chamard, 2007; Wiles & Costello, 2000). Wiles and Costello (2000) found evidence that 50% of offenders traveled to nearby cities and that the most vulnerable cities were the ones most adjacent to the offender's home. They also indicated that the importation and exportation of not only offenders, but non-offenders, focus around shopping districts and leisure activities (2000, p. 40).

There was a significant difference in the import and export of offenders across the CPI classification used within the study. It is interesting to note from the results that cities classified as core exhibited higher levels of export of juveniles than would have been

anticipated from the availability of amenities within the city.

Although from initial interpretation of the results it may appear counterintuitive that core city residents often choose not to make use of the wealth of amenities within their immediate area, the results may be supported by the findings associated with the buffer zone around the juvenile's home address. This is most likely due to the supervision aspect mentioned previously and the juveniles' not wanting to be in areas where they are likely to encounter adults that know them. Residents of peripheral cities are likely to travel beyond the 1-mile buffer identified to utilize amenities within their own city.

Implications. The implications of this inter-city movement could potentially help policy makers better understand the impacts of their programs both at the city level and importantly at the regional level. In addition, the application of the buffer zone information and the knowledge of the relatively low median distances traveled may prove to be a better indicator of where potential offenders will congregate as opposed to the use of the home address as the start point for analysis, as 93% of the study population have been shown to hangout a mile or more away from home. This information can be useful for

the geographic profiling programs that identify locations of offenders. If it is possible to integrate extensions into these programs that can identify known activity space locations for juvenile delinquents, various points could be use to determine probable location points for a potential offender. Additionally, since it is shown that juveniles will travel between cities adjacent to their own, cooperation between city policing agencies could improve crime prevention efforts. For example, it the city of Palm Desert has a city curfew of 10 p.m. for minors and the city of La Quinta does not, it is probable that youth will gravitate towards the city with less restrictions. Future research may consider the different laws/restrictions on a city-to-city basis and then look at whether or not those cities with the least restrictions have a higher importation of offenders.

Limitations. These findings are specific to cities with unique geographical and built environmental characteristics that are not universally applicable; therefore any interpretation of results must be undertaken with explicit reference to those contextual factors.

The research is also based upon one specific area of Southern California characterized by the mountainous desert communities from which the study population is

drawn. Further additional and dissimilar study populations would be required to evaluate the wider applicability of the research findings.

Summary. From the outset of the research, the levels of amenities were expected to prove to be major attractors for juvenile delinquents from outside the area. However, the findings have shown that this has not been as influential of a factor as first anticipated. The 1-mile buffer zone appears to be a more significant influence over juvenile decision-making processes. These findings reinforce the proposition that a lack of adult supervision (specifically adults who may know the juveniles) at desirable activity nodes locations is an important factor/determinate in where juveniles choose to congregate.

Research Question 3

The third research question examined how far juveniles travel to their activity places. The results showed that there was evidence of a 1-mile buffer around the home address of the juveniles, within which only a minority of juveniles (7.3%) undertook activities. Beyond the 1-mile buffer, 51.8% (n = 494) of the juveniles undertake activities within 3 miles of their home with three quarters traveling less than 5 miles from their

residence. The single largest group were those that traveled between 1 and less than 2 miles which accounted for 25% (n = 646) of the total study population.

These distances to activity places are in accordance with journey to crime studies which have found that offenders tend not to travel great distances (Davies & Dale, 1995; Meany, 2004; Smith, Bond, & Townsley, 2008; Wiles & Costello, 2000; Turner, 1969). However, prior studies such as Clarke and Eck (2007) found juveniles travel under 1 mile, where the majority of the study population in this research traveled at least 1 mile and less than 2 miles.

Evidence for the buffer zone is comparable to what has been found before. In this study, the single largest cohort in the study traveled between 1 > 2 miles with a pattern of decreasing frequency of juveniles with increasing distance. Again, in line with distance based offending pattern studies (Davies & Dale, 1995; Felson, 2003; Rengert et al., 1999) travel patterns are similar with high concentrations observed immediately beyond the buffer zone. The findings reinforce the premise put forth in the introduction of this study that juvenile activity nodes are better primary analysis nodes when exploring offending behavior patterns than the home address. In

other words, as offenders of all kinds have shown to travel outside their buffer zone to commit offenses beyond where they could be identified (Rossmo, 1993; Van Koppen & De Keijser, 1997) juveniles in turn are traveling outside their buffer zone to their activity nodes. This could mean that a juvenile who is likely to offend, would commit offenses when they do not have suitable handlers, where there will be a lack of a capable guardians, and where they won't be recognized. This indicates that the activity node would be a better indicator of starting point into analysis of juvenile offending than the residence.

Prior journey to crime studies use the residence as the starting point for the analysis of an offender's crime pattern analysis (Van Koppen & De Keijser, 1997; Rengert et al., 1999; Smith, Bond, & Townsley, 2008). These findings are different because they identify the distances and travel patterns associated with juvenile activity node locations. This may provide valuable information in terms of journey to crime analysis because it provides an alternative analysis node and it may be a more accurate indicator of potential patterns of juvenile journey to crime and associated offense locations and distances traveled. It can be assumed from the survey results that juveniles traveling a mile or more away from home are

congregating with their peers, which research has shown to be important in a young delinquents influence to commit offenses (Agnew & Peterson, 1998; Brantingham, 1995, 1998; Felson, 2002, 2006).

Additionally, the analysis showed that across all variables, a positive logarithmic variation was present and performed well explaining between 84.25% and 97.19% of the observed variation. This confirms and supports the findings that beyond the 1-mile buffer zone, the vast majority of juveniles travel relatively short distances to their activity node, with progressively fewer traveling greater distances. The lowest performing regression equation is for the core city class, with the highest performing regression being the isolate city class. They all conform to the same pattern, and there is limited variation in the patterns observed, however, that limited variation may be associated with the types of amenities available to the youths. The core city class variation may be due in part to the higher amount of choices available to the juveniles residing in those cities. Juveniles in the isolated cities have fewer choices available within the reasonably short distances that the research reports they are likely to travel to these amenities; hence less variability in the median distances traveled and the

resulting higher performance of the regression equation calculated.

Implications. The inclusion of the activity nodes as a possible journey to crime commencement node in both analysis and journey to crime software packages (Rigel Analyst; CrimeStat; Dragnet) would aid the production of city specific juvenile travel pattern profiles. Since the geographic mapping programs use home address as the anchor point of analysis, this information would significantly improve the geographic profiling of at-risk youth when the home address is unknown.

Future research in the field of juvenile journey to crime with incorporated activity nodes would be better served if some additional information were collected. As prior studies have suggested (Felson, 2006; Agnew & Peterson, 1998) youth without handlers tend to find greater opportunities for offending. In addition to asking the juveniles how much time they spend engaged in leisure activities with and without supervision (parental or adult), it would also be of benefit to inquire about the day of the week they spend the most time away from home. This would enable the development of better understanding if weekdays or weekends are a higher risk for proprietors

of the businesses or convergence settings that the youths patronize.

Limitations. The surveys were administered by probation officers but were self-reports by juveniles. It is likely that juveniles may over or under-report actual locations that they go to. In addition, there is an abundance of missing data because names and locations of activity destinations were incorrect and therefore invalid. Because of this, many candidates for geographical analysis were excluded if there were less than four complete activity node addresses.

Distances were calculated using the activity points provided by the juveniles at the time of the survey administration. No information about how often the juvenile frequented these locations was captured. Therefore the measurements utilized are indicative of median distances traveled to a subjective limited range of locations rather than being a direct measure of actual patterns of travel.

Summary. The evidence for the existence of a buffer zone is consistent with previous published research which identifies a buffer zone associated with offense activity patterns (Davies & Dale, 1995; Felson, 2003; Rengert et al., 1999). The pattern that emerged established the basic

distance parameters for juvenile journey to crime analysis within the study population.

Conclusions

Prior studies suggest that juveniles spend their discretionary time engaging in activities at locations with low levels of supervision and high delinquency potential (Agnew & Peterson, 1989; Osgood et al., 1996, Felson, 2003, 2006; Brantingham, 1995, 1998), it is therefore important that we know more about the nature and patterns of travel to such locations. There are several theories that contribute to understanding the choices made and patterns of juvenile behavior. Routine Activities and Crime Pattern theory combined with journey to crime research can help develop insight into how the juveniles in the study gravitate towards attractors that could present opportunities for delinquency.

Routine Activities and Crime Pattern theory postulate that lack of proper supervision and availability of suitable targets as well as the inclusion of environmental components contributes to crime opportunities presenting themselves within a juvenile's regular activity pattern (Felson, 2003, 2006; Brantingham, 1998). Assuming this is true, this research can draw conclusions based on the

findings that juveniles will travel certain distances away from their home for recreational activities so therefore it is likely that while on their routine "journey" they may encounter opportunities to commit crimes. The juveniles in this particular study have already been identified as delinquents through the schools that they attend. If they exhibited delinquent behavior at school, they may exhibit delinquent behavior elsewhere.

Journey to crime analysis is a tool that provides researchers as well as crime practitioners' information about how far juveniles are likely to travel during a crime trip. The theories behind the main body of the journey to crime literature make several key assumptions. The first assumption lies with the home residence being the start of an offender's journey (Van Koppen & De Keijser, 1997; Rengert et al., 1999; Smith, Bond, & Townsley, 2008). This research puts forward the proposition that the places youth activity nodes, are part of the juvenile's regular activity pattern and may be a more accurate indicator of the start of a "journey" that may be associated with the potential for a criminal incident. This research supports the findings by Rengert, Piquero, and Jones that home sites are not necessarily suitable measures of an offender's crime trip and that by

using aggregated data based on the use of a buffer zone, there may be a more reliable way to measure the journey (1999).

This research accepts that the juveniles originate their journey from home, but it argues that the juvenile delinquents aren't necessarily leaving home to commit crime. It is more likely that if it is part of their routine to go a mile to get to their activity nodes, then it is just as likely that they will be traveling at least a mile to offend. The 1-mile buffer zone becomes the radius of a circle which would result in a distance error of at least 1-mile if the home is used as the anchor point. The analysis conducted shows that the 1-mile buffer zone around the individual's residence is applicable to 93% of the study group, with over 50% of these juveniles traveling less than 3-miles. Therefore, there is a minimum of a 33% error built into any calculation that assumes the home is the anchor point for over half the study group. This is important for the application of geographic profiling software as well as for any crime prevention and reduction policy development specific to juvenile delinquents.

The second assumption that journey to crime research makes is that most offenders in the studies are adult

males living in urban environments. This study addresses that bias in the literature by incorporating both male and female juveniles, and those living in core (urban), periphery (suburban), and isolate (rural) areas. Females were found to travel slightly further than males, and juveniles from isolated cities were found to travel further distances than those residing in core environments. The greater significance lies within the city classification, which has been largely overlooked by prior studies. If an offender lives in a city that is isolated from amenities that are more easily accessed by those living in core or periphery cities, they will have to travel further to get to those amenities. Prior studies that only look at the travel patterns of individuals living in urban environments are excluding the variation associated with distance traveled to hangouts, which make act as offense journey origin nodes.

The third key assumption made in journey to crime research looks at aggregated levels of data and assumes distance decay occurs. Like Rengert et al. (1999), which identified the importance of using individual level data, this study used individual level data enabling the greatest utility to be gained from the analysis. The research found clear evidence of both an activity space

buffer zone around the individual's home address, and a common pattern of distance decay across all variables studied. Combined with the findings which quantify the distances traveled by discrete juvenile delinquent cohorts, the role of the city of residence characteristics, and inter city import and export of juvenile delinquents, the specification of distance decay equations completes the analytical aims and objectives of this research. There are clear benefits to be gained from the application of such knowledge to the development of juvenile delinquent diversion and police intervention initiatives. Improved intelligence about the patterns of travel to and locations of juvenile hangout locations will serve to aid the development of informed policy decisions and promote the sharing of data and collaborative working between cities

The findings of the research and the methodologies used have produced new and valuable information about the juvenile delinquents within the study. The application of these processes would enable the production of improved information and evidence to support tailored and targeted resource allocation for youth diversion and policing policies. In other words, if you know more about the problem or which youth are at risk, you can be more

precise about how the program is developed and targeted to those most vulnerable within the community. For example the development of age appropriate programs using the right sort of language, incentive programs, and reward schemes, targeted and delivered within areas identified as likely hangouts for the specific age group.

The research findings provide additional layers of information which it is proposed would add value and gain from being combined with additional demographic and socio-economic risk factors that may be associated with the potential for or prevalence of juvenile offending. Combining multiple sources of information is likely to add value beyond the basic sum of the component parts through deriving new variables and insights about the characteristics associated with both the juvenile delinquents and their environment.

APPENDIX A

COMPLETE LITERATURE REVIEW MATRIX

Table 14. Complete Literature Review Matrix

Offence Classification	Author/Year	Distance in Miles	Mean or Median	Study Area
Aggravated Bodily Harm	Wiles, Costello (2000)	1.93	mean	UK
Assault	Phillips (1980)	.70	mean	USA
Auto theft	White (1932)	3.43	mean	USA
Auto theft	Phillips (1980)	1.15	mean	USA
Auto theft	Gabor and Gottheil (1984)	1.24	mean	CAN
Burglary	White (1932)	1.76	mean	USA
Burglary	Reppetto (1974)	0.5	--	USA
Burglary	Phillips (1980)	1.05	mean	USA
Burglary	Rhodes and Conly (1981)	1.20	median	USA
Burglary	Gabor and Gottheil (1984)	0.35	--	CAN
Burglary	Sarangi and Youngs (2006)	.81	median	IND
Burglary	Smith, Bond, Townsley	1.37	median	UK
Commercial armed robberies	Snook, Wright, House, Alison (2006)	.09	median	CAN
Commercial Robberies (series of 2 or more per offender)	Laukkanen, Santtila (2006)	50% < 2.19 shorter for single offender at 1.38	median	FIN
Disorderly Conduct	Phillips (1980)	1.06	mean	USA
Domestic Burglary	Wiles, Costello (2000)	1.88	mean	UK
Drug Related	Phillips (1980)	1.93	mean	USA
Grand Larceny	Phillips (1980)	1.31	mean	USA
Loitering	Phillips (1980)	1.65	mean	USA
Non-Domestic Burglary	Wiles, Costello (2000)	1.83	mean	UK
Non-Residential Burglary	Pyle (1974)	2.34	--	USA
Nonserial Rape	Lebeau (1987 a,b,c)	3.5	mean	USA
Petty Larceny	Phillips (1980)	2.46	mean	USA
Public Intoxication	Phillips (1980)	1.37	mean	USA
Rape	Amir (1971)	72% within home area (5 blocks)	--	USA
Rape	Lebeau (1987 a,b,c)	2.5	mean	USA
Rape	Pyle (1974)	1.34	mean	USA

Offence Classification	Author/Year	Distance in Miles	Mean or Median	Study Area
Rape	Rhodes and Conly (1981)	0.73	median	USA
Rape and Indecent Assault	Gabor and Gottheil (1984)	1.43 mi (90% in-towners)	--	CAN
Rape/Sodomy	Hanfland (1982)	2.66	--	USA
Rape	Santtila, Zappala, Laukkanen, Picozzi (2003)	1978: 1.43 mi; 1990: 0.45 mi; 1996: 3.01 mi	mean	ITALY
Residential Burglary	Pyle (1974)	2.48	--	USA
Robbery	Rhodes and Conly (1981)	1.62 mi	median	USA
Serial Burglary	Snook (2004)	1.06	median	CAN
Serial Murder	Canter and Hodge (1997)	24.85	mean	USA
Serial Rape	Canter and Larkin (1993)	1.53	mean	UK
Serial Rape	Lebeau (1987 a,b,c)	1.77 mi.	mean	USA
Serial Rape	Rossmo and Baeza (1998)	2.5	--	USA
Serial Rape	Topalin (1992)	2.81	--	UK
Serial Rape	Warren et. Al (1998)	3.14	mean	USA
Serial Rape and related crime	Lebeau (1992)	7	mean	USA
Sexual Homicide	Shaw (1998)	1.0	median	UK
Sexual Homicide of Elderly Females	Safarik et al. (2000)	0.42	mean	USA
Shoplifting	Wiles, Costello (2000)	2.51	mean	UK
Stranger Rape	Davies and Dale (1995)	52%<2 mi.	--	UK
Stranger Serial Sexual Assault	Alston (1994)	55.6%<.93 mi.	--	CAN
Theft from Vehicle	Wiles, Costello (2000)	1.97	mean	UK
Taken Without the Owners Consent (vehicle)	Wiles, Costello (2000)	2.36	mean	UK
Vandalism	Phillips (1980)	1.31	mean	USA
Various	Wiles, Costello (2000)	1.93	mean	UK
Various	Brumwell (2007)	50% < 1mi	mean	UK
Various	Chamard (2007)	1.1	median	USA
Vehicle Theft	Lu (2003)	3.08	mean	USA
Various	Turner (1969)	41% of a mile	median	USA

APPENDIX B

COMPLETE CITY CLASSIFICATION TABLE

Table 15. City Classification

CITY (n=56)	CPI CLASS
CORONA	Core
HEMET	Core
PALM DESERT	Core
RIVERSIDE	Core
TEMECULA	Core
BANNING	Periphery
BEAUMONT	Periphery
BERMUDA DUNES	Periphery
CATHEDRAL CITY	Periphery
CHINO	Periphery
CHULA VISTA	Periphery
COACHELLA	Periphery
DESERT HOT SPRINGS	Periphery
HOME GARDENS	Periphery
INDIAN WELLS	Periphery
INDIO	Periphery
LAKE ELSINORE	Periphery
MIRA LOMA	Periphery
MORENO VALLEY	Periphery
MURRIETA	Periphery
NORCO	Periphery
PALM SPRINGS	Periphery
PEDLEY	Periphery
PERRIS	Periphery
RANCHO MIRAGE	Periphery
REDLANDS	Periphery
ROMOLAND	Periphery
RUBIDOUX	Periphery
SAN JACINTO	Periphery
BLYTHE	Isolate
CABAZON	Isolate
CALIMESA	Isolate
CANYON LAKE	Isolate
CHERRY VALLEY	Isolate
DESERT SHORES	Isolate
HOMELAND	Isolate
IDYLLWILD	Isolate
INDIO HILLS	Isolate
JURUPA	Isolate

APPENDIX C

DETAILED REGIONAL IMPORT/EXPORT TABLES

C-1. Table 16. Region 1 Detail

	CITY	SCHOOL			HANGOUT			FAST FOOD			MOVIE			VIDEO			SHOPPING		
		L	+	-	L	+	-	L	+	-	L	+	-	L	+	-	L	+	-
CORE	Palm Desert	149	28	8	55	62	22	78	27	23	6	11	100	90	20	10	92	512	14
PERIPHERY	Bermuda Dunes	0	0	22	0	1	7	2	7	13	0	0	16	5	13	7	0	0	14
	Cathedral City	255	62	57	47	16	21	182	32	24	159	208	45	170	54	1	48	45	157
	Coachella	61	3	129	30	4	9	71	21	34	0	0	100	67	23	28	9	16	97
	Desert Hot Springs	164	4	30	35	1	18	122	4	31	0	0	150	136	2	6	16	2	139
	Indian Wells	0	0	2	0	0	1	0	0	1	0	0	2	0	0	2	0	0	2
	Indio	134	12	61	54	10	13	158	98	10	123	176	46	123	51	23	66	127	107
	Palm Springs	172	80	16	54	6	15	115	24	30	42	20	86	88	4	27	66	60	79
	Rancho Mirage	0	0	18	4	37	5	0	8	14	7	316	7	0	0	10	0	0	11
ISOLATE	Blythe	106	2	2	26	0	0	43	1	17	61	1	1	48	2	0	14	2	35
	Cabazon	0	0	3	-	1	-	-	-	-	-	-	-	-	-	-	-	18	0
	La Quinta	141	62	12	28	7	24	72	16	28	0	0	102	80	25	20	8	36	99
	Mecca	1	0	46	9	0	5	12	1	21	0	0	26	0	0	17	0	0	34
	Mountain Center	0	0	2	-	-	-	0	0	1	0	0	1	-	-	-	0	0	1
	Ripley	0	0	2	1	0	0	0	0	2	0	0	1	0	0	2	0	0	2
	Thermal	57	171	3	7	2	5	2	0	29	0	0	30	0	0	25	0	0	37
	Thousand Palms	0	0	39	3	1	7	21	19	2	0	0	23	0	0	18	0	0	24

C-2. Table 17. Region 2 Detail

	CITY	SCHOOL			HANGOUT			FAST FOOD			MOVIE			VIDEO			SHOPPING		
		L	+	-	L	+	-	L	+	-	L	+	-	L	+	-	L	+	-
CORE	Hemet	84	6	40	31	8	4	93	21	14	70	18	28	59	19	15	57	87	49
	Temecula	130	18	0	65	22	1	121	10	0	114	91	5	103	6	33	111	142	5
PERIPHERY	Banning	34	3	7	-	2	-	4	17	3	7	41	0	3	1	0	1	10	5
	Beaumont	109	18	3	21	0	3	47	6	23	0	0	60	50	4	3	2	0	69
	Canyon Lake	0	0	14	0	0	4	1	1	10	0	0	11	0	0	5	0	0	11
	Cherry Valley	0	0	9	1	0	0	1	0	3	0	0	2	0	0	1	0	0	3
	Lake Elsinore	83	16	46	26	3	5	69	14	2	3	0	65	55	9	1	21	24	51
	Moreno Valley	269	108	7	71	12	6	157	13	13	84	5	42	128	31	0	134	173	30
	Murrieta	0	10	14	1	5	6	5	3	5	2	60	11	5	6	3	0	6	13
	Perris	290	66	113	108	8	25	276	15	29	229	32	51	176	9	53	121	28	200
	Romoland	1	1	15	3	1	3	0	0	9	0	0	10	0	0	7	0	0	13
	San Jacinto	163	28	17	37	2	9	116	18	12	95	17	18	89	13	10	24	14	98
ISOLATE	Homeland	0	0	8	0	0	5	0	0	6	0	0	7	0	0	5	0	0	7
	Menifee	21	27	17	7	2	8	20	8	10	0	0	23	2	2	21	4	1	28
	Nuevo	0	0	6	0	0	1	0	0	4	0	0	3	0	0	1	0	0	4
	Quail Valley	0	0	13	1	0	5	0	0	10	0	0	9	0	0	6	0	0	10
	Sun City	0	0	28	8	2	3	16	10	6	0	0	23	14	21	5	0	2	22
	Winchester	0	1	8	0	2	0	1	0	5	0	0	4	0	0	7	0	0	5

C-3 Table 18. Region 3 Detail

	CITY	SCHOOL			HANGOUT			FAST FOOD			MOVIE			VIDEO			SHOPPING		
		L	+	-	L	+	-	L	+	-	L	+	-	L	+	-	L	+	-
CORE	Corona	256	2	21	67	6	15	182	2	10	163	13	19	149	0	5	56	1	125
CORE	Riverside	51	57	24	16	22	1	31	10	3	31	21	5	29	10	1	24	121	12
PERIPHERY	Mira Loma	11	22	20	1	1	7	11	1	10	0	0	19	4	3	4	1	0	21
PERIPHERY	Norco	14	13	1	4	2	4	12	7	1	0	0	13	8	0	1	5	2	8
PERIPHERY	Rubidoux	0	0	7	0	0	3	1	2	3	0	0	5	0	0	4	0	0	4
PERIPHERY	Wildomar	0	0	39	0	0	5	0	0	19	0	0	18	0	0	15	0	0	20

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