THE SPATIO-TEMPORAL EFFECTS OF SPECTATOR EVENTS ON CRIME

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ABSTRACT

People's movements across time and space affect crime opportunities, and in turn, are influenced by the physical environment. Facilities such as bars, shopping malls, schools, and entertainment districts for example affect routine activities and the criminal event. Such places act as crime attractors or generators. Attractors possess crime opportunities, pulling intending criminals who act on these opportunities, while generators do not necessarily draw intending criminals, but possess many opportunities resulting in crime problems. Spectator events such as hockey games draw large numbers of people and may function as crime attractors and/or generators and such impacts on crime patterns have been largely unexplored. This analysis examines the home arena of a local National Hockey League club as a possible attractor/generator. As a spectator event, this venue draws many people into Vancouver's downtown core on game nights, changing crime opportunities and the spatio-temporal distribution of crime in the downtown.

Keywords: Crime attractors, crime generators, spectator events

Subject Terms: Environmental criminology, routine activity theory, crime pattern theory, rational choice theory
DEDICATION

To my parents, and to my grandparents who have passed. Your unwavering support has allowed me to achieve and exceed even my own expectations, and will no doubt help me to excel in the future.
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CHAPTER 1: INTRODUCTION

Criminology is a multifaceted discipline encompassing many streams of thought. While not every area of the discipline endeavours to explain the cause of crime, many do, and include, but are not limited to, psychological, sociological, and biological explanations of crime. These approaches offer offender-centric explanations, that is, they attempt to explain crime by examining the effects of different variables on the offender. One approach; however, examines the influences of environmental and geographical effects on the criminal event, and how these effects, or environmental cues are interpreted by the offender. Environmental criminology is concerned with the spatial distribution of crime, particularly how the geographic distribution of offenders, targets, guardians and their convergence in time and space alters opportunity structures for crime, thereby influencing criminogenic behaviour (Brantingham and Brantingham, 1991).

Influences on the spatial distribution of crime are multifaceted and continually changing. These changes reflect opportunity structures that result in the criminal event. Such influences, or environmental cues, are interpreted differently by each individual and along with urban landscape affect individuals' routine activities and movements in time and space. It is through these routine activities that criminals and non-criminals alike encounter criminal opportunities, however, many people resist or ignore these opportunities (Brantingham & Brantingham, 1993b). As such, individuals' movements through the urban landscape are affected by the distribution of different land uses (Timms, 1971), the design of pathways (Brantingham & Brantingham, 1993b), road networks (Beavon, Brantingham & Brantingham, 1994), and the availability of public
transport (Brantingham & Brantingham, 1991) which coalesce to influence how people move throughout the urban landscape. The distribution of criminal justice resources (Harries, 1974), the location of bars (Block & Block, 1995), schools (LaGrange, 1999), shopping malls (Kinney, Brantingham, Wuschke, Kirk, & Brantingham, 2008) and other activity nodes, including residential, commercial, workplaces and other entertainment nodes (Brantingham & Brantingham, 1984, 1991, 1993b) affect the environmental backcloth, opportunity structures, and how would-be offenders encounter and perceive environmental cues that characterize the criminal event.

Certain places and spaces are more conducive to crime than others, particularly when they result in the amassing of large numbers of people into one geographic location. Such areas or activities may include concerts, festivals, shopping districts/malls, or sporting events. Activity nodes that draw people for particular purposes have been designated crime attractors and crime generators. The former are those areas known to possess opportunities for crime drawing highly motivated offenders for criminal purposes, while the latter are those areas that draw people for legitimate activities and purposes but while there, the necessary environmental cues accumulate creating a criminal opportunity which results in an individual pursuing the criminal opportunity (Brantingham & Brantingham, 1995a).

The criminality of place literature is vast and has examined various attractors and generators such as bars (Block & Block, 1995; Bonney, 1992; Briscoe & Donnelly, 2003; Bromley & Nelson, 2002; Fox & Sobol, 2000; Greenfeld, 1998; Ireland & Thommeny, 1993; Roncek & Maier, 1991; Stevenson, Lind, & Weatherburn, 1998), schools (LaGrange, 1999; Roncek & Faggiani, 1985; Roncek & Maier, 1991), tourist destinations (Rengert, 1997), drug markets (McCord & Ratcliffe, 2008; Rengert, 1996) transit centres (Smith & Clarke, 2000), and shopping malls (Brantingham & Brantingham, 1993c, 1995b, 1998; Kinney et al., 2008), for example. But other than theorizing about the
effects of spectator events on crime patterns (Brantingham & Brantingham, 1991, Felson, 2002), few studies exist exploring how individually occurring spectator events (Barker, 2004; Decker, Varano, & Greene; Hall, Selwood, & McKewon, 1995; Miller, Heath, Molcan, & Dugoni, 1991; Phillips, 1983) and routinely occurring spectator events (Lin, 2007; Rees & Schnepel, 2008; Sachs & Chu, 2000; White, Katz, & Scarborough, 1991) affect crime patterns, while none have focussed specifically on the effects of hockey games.

This analysis explores the effects of spectator events on crime patterns with a focus on a local professional hockey team in a Canadian city. A spectator event, such as a hockey game, other sporting events, concerts, or festivals, for example, draw large numbers of people into a particular geographic location to attend an event or engage in a particular activity. These events may act as either crime attractors or generators, drawing both criminal and non-criminal populations to the event in question, changing the environmental backdrop and criminal opportunities.

Spectator events may be divided into two categories. First, keystone spectator events happen once, such as special concerts like SARS Stock in Toronto which drew 450 000 people to Downsview Park (CBC, 2003, Online) or the Live 8 concerts, which attracted large numbers of people to raise political awareness preceding a G8 Summit (Harrington, 2005). Keystone spectator events may also include annually occurring activities, such as Canada Day and Independence Day fireworks. The second type of spectator events routinely occur on a scheduled basis, for example, professional (or otherwise) sporting events like hockey or football. This differentiation is important because keystone events can change crime patterns for a single day or in the days immediately preceding or following the event, while routine events can change crime patterns at a societal-structural level, thus having a continual impact on crime patterns throughout the time period in question, such as during a hockey season.
This study proceeds by examining how the occurrence of games of a local National Hockey League (NHL) team, the Vancouver Canucks, affects crime patterns in the downtown core of Vancouver, British Columbia. The crimes of interest are assault, theft from auto, vehicle theft and disorder crimes. Through analyzing seven years of data, the findings are expected to show that crimes will increase during seasons when the Canucks are playing, and further, that within the hockey season, the highest levels of crimes will be experienced on home game days, followed by away game days, and non-game days.

The following analysis is exploratory in nature and is based on the theoretical underpinnings of environmental criminology. It draws on the concepts of Cohen and Felson’s (1979) routine activities theory (RAT), Brantingham and Brantingham’s (1984, 1993b, 1998) crime patterns theory (CPT), and Cornish and Clarke’s (1986) rational choice theory (RCT), but relies heavily on the crime attractor and crime generator principle to explain findings (Brantingham & Brantingham, 1995a).

These theories are applied to assess the effects of routinely occurring spectator events on crime patterns through the use of several data sources including police data obtained from the Vancouver Police Department (VPD), the Liquor Control and Licensing Board (LCLB) data provided by the Ministry of Public Safety and the Solicitor General (PSSG), and NHL Season data. From these data, changes in crime patterns are assessed through descriptive statistics, measures of crimes per day, mapping, and location quotients (LQ). Finally, much of the data will be subjected to a new application of the location quotient, the LTQ, or the location time quotient, used previously, but only at the yearly level (Robinson, 2008).

The effects of many attractors and generators have already been assessed, largely leaving spectator events unexplored. Like other land uses, it is expected that...

1 The 2004/2005 season did not proceed due to a player lockout.
spectator events, individual or routinely occurring, will act as a crime attractors or
generators, changing routine activities, the environmental backcloth, and consequently
opportunity structures to such a degree that for individual spectator events, spikes in
crime will be seen, or for routinely occurring events, a consistent change in crime
patterns will be experienced. As such, an examination of the effects of spectator events
on crime patterns is a necessary endeavour. Such an analysis has broad applicability to
any city with regularly occurring sporting events (professional or otherwise), hosting
concerts, festivals and the like, as it may aid police in preparing for such events and/or
implementing crime reduction strategies.
CHAPTER 2: LITERATURE REVIEW

The following section begins by providing a brief overview of the roots of environmental criminology, followed by an in depth discussion of the central theories: routine activities theory, crime patterns theory, and rational choice theory, and how they apply to this analysis. Following the theoretical section is a directed discussion of the spatial and temporal facets of crime.

2.1 The Roots of Environmental Criminology

Environmental criminology represents a movement away from offender-focussed explanations of crime, and towards the criminal event, that is, how the would-be offender interacts with his/her environment in time and space thereby producing criminal opportunities: "Crime is an event that is best viewed as an action that occurs within a situation at a site on a non static backcloth" (Brantingham & Brantingham, 1993a, p. 266). Environmental criminology finds its roots in human ecology with the works of Burgess (1916, 1925) and Shaw and McKay ([1942] 1969), who early on recognized the influence of geographical and physical factors on delinquent behavior, and Hawley (1950) who recognized the importance of temporal organization in society.

Burgess (1916) noted that two environmental factors influenced delinquency, the "semi-rural characteristics of dwelling" and "the proximity to the business street" (p. 726). In his concentric zone model, he acknowledged the spatial distribution of delinquency, vice, and many other social ailments as collecting at the edge of the first zone and spilling into the second, transition zone, where the slums are located. As one moves outwards from zone to zone, the standard of living increases, residents become more
permanent, and less transition occurs. Zone II is in a continual state of flux as new immigrants move in and old immigrants are forced out. The concentric zone model explains the frequent turnover of residents in the first and second zones and “is accompanied by excessive increases in disease, crime, disorder vice, insanity, and suicide, rough indexes of social disorganization” (Burgess, 1925, p. 57). This model asserts that delinquency, vice, and social ailments are spatially distributed in the inner transition zones: It is not the particular geographic location that is the cause; rather, it is the frequent transition of residents in and out of said space which lead to social disorganization, and therefore crime.

Shaw and McKay ([1942] 1969) expanded on Burgess’ (1925) work, relating the structural environment to delinquency, “the distribution of juvenile delinquency in space and time follows the pattern of the physical structure and of the social organization of the American city” (Burgess, 1942 as cited in Shaw and McKay, 1969, p. xxv). As old residents move out of the area and new immigrants move to the inner city, vital institutions serving the previous population can no longer adequately cater to the new population, thus increasing rates of delinquency (Shaw and McKay, 1969).

Shaw and McKay (1969) assert that the degree to which any given group contributes to delinquency in the city is – in part – a result of the area in which they reside and for what period of time. Two scenarios emerged from this research. Firstly, when an area of the city has an influx of new residents, displacing the old residents, social disorganization, and delinquency result. Secondly, if a group remains for an extended period of time in the same space, then the institutions are better able to service the population’s needs, thereby decreasing the rate of delinquency (Shaw & McKay, 1969). Shaw and McKay’s (1969) work includes a temporal component in that the length of time the population remains in the given area affects delinquency, however, this was not an explicit concern.
Hawley (1950), however, directly addressed temporal variations in human activity, which later influenced the development of RAT (Cohen and Felson, 1979). Hawley (1950) explains the “temporal aspect of ecological organization” (p. 288) in three concepts, rhythm, tempo and timing. Rhythm is the regular intervals within which events occur; tempo is the number of criminal events per unit of time; and timing, refers to how the rhythm and tempo act correlate. Cohen and Felson (1979) explain the impact of Hawley’s (1950) work on crime: rhythm applies to travel activities of offenders; tempo is the number of criminal violations per day in a given area; and timing is how different, yet interdependent activities that must converge for the criminal event occur do, such as the victim and offender’s rhythms. The convergence of these factors is dependent on routine movements across time and space on an ever-changing environmental backcloth (Brantingham & Brantingham, 1984).

Ecological theory serves as the basis for environmental criminology; however, it would not emerge formally as environmental criminology until many years later. Brantingham and Jeffery (1991) noted that although the spatial aspects of crime were present in Burgess’s (1916, 1925) and Shaw and McKay’s (1969) work, they did not form a theoretical foundation in this era because the focus of criminological thought was on the sociological motivations of criminal behaviour. Although human ecologists formed the foundation for environmental criminology, they were not the first to recognize the geographic dispersion of crime and how the movement of people about time and space affects opportunity structures.

In examining the distributions of convictions for violent and property from the early crime statistics in France, Guerry (1832 as cited in Brantingham & Brantingham, 1991) and Quetelet (1842) found that these crimes were not evenly distributed across the country and that these distributions were further influenced according to effects whether the area was urbanized or rural.
Ferri (1896) and Lombroso (1911) recognized the effects of population density on opportunity structures. Lombroso (1911) explained that more densely populated areas have higher rates of such crimes as robbery and fraud because criminal networks increase. Lombroso recognized that population density influences people’s movement in time and space. As population density increases, so too does the criminal population and chances for these individuals to form criminal networks, while also increasing the number of suitable targets. Lombroso (1911) also recognized the potential deterrent effects of a more densely populated area because "a decrease in crimes against the person [may result], due to the restraints imposed by mutual supervision" (p. 146). Lombroso’s (1911) work on mutual supervision pre-figured the idea that the presence of a suitable guardian may decrease or prevent the criminal event due to its effects on opportunity structures. This concept of the capable guardian would be advanced many years later (Jacobs, 1961; Jeffery, 1971; Newman, 1972; and Cohen and Felson, 1979).²

A central concern of environmental criminology is the built environment, how it affects opportunity structures, and how it may be further designed to prevent or deter crime. Urban planner, Jane Jacobs, first proposed the latter in 1961; she recognized that community cohesion could increase safety, and further, that such cohesion may be improved through proper urban design. However, she asserted that improper design can impede such cohesion as was occurring during this time.

Similarly, Oscar Newman, an architect, felt crime reduction is possible through carefully designed physical environments. Newman (1972, 1996) asserts that certain types of structural design can be conducive to creating a community of residents, which will naturally and spontaneously create safer spaces and reduce crime. Newman (1972) explains his idea of defensible space as

² For a thorough review of the origins of environmental criminology, see Brantingham & Brantingham (1991).
a model for residential environments which inhibits crime by creating the physical expression of a social fabric that defends itself...an environment in which latent territoriality and sense of community in the inhabitants can be translated into responsibility for ensuring a safe, productive, and well-maintained living space (p. 3).

The premise here is that the way people interact in residential areas can facilitate safety and urban design can influence this interaction. The goal is that by forcing people to interact through manipulating the urban environment, we can encourage gains and increased levels community cohesion, consequently increasing safety and reducing crime. This proactive measure was not seen in any substantial form before the 1970s.

The pre-1970s was a period where criminal justice policy took a reactive approach, an approach that Jeffery (1971) criticized. He proposed that the dealing with crime and offenders reactively was insufficient, asserting that proactive measures must be made to reduce crime. Jeffery (1971) sees human behavior as a product of the physical environment, "it is only logical that environmental engineering can be used to reduce those urban crime rates" (Jeffery, 1971, p. 215). Jacobs, Newman, and Jeffery focused on the nature of built environment, setting the foundation for how we understand the criminal event today.

Harries (1974, 1980), a geographer, recognized that crime is spatially distributed and may be affected by environmental characteristics. Like environmental criminologists (e.g. Cohen and Felson, 1979; Brantingham and Brantingham, 1984; and Cornish and Clarke, 1985), Harries (1974, 1980) realizes that other disciplines seek to determine the causes and cures for crime. Causes of crime are numerous and therefore necessitate as many cures; however, in searches for the cure, the spatial element is ignored. Harries (1974) does not claim that determining the spatial element will explain why crime occurs or how to cure it, but rather, it adds another level of understanding to its occurrence. For example, as city size increases, so too does mobility and land use, which may lead to a
greater number of criminal opportunities. More criminal opportunities make crime control more difficult than it may be in smaller cities where fewer opportunities may exist (Harries, 1980). Furthermore, the spatial distribution of criminal justice resources – police, the judiciary, and other criminal justice system services and institutions – may affect the distribution of incidents and opportunity structures (Harries, 1974).

How people move about in time and space is central to the criminal event and opportunity based theories. Figure 2:1 – Routine Activities and Awareness Space illustrates individuals’ routine movements through time and space and how these movements reveal criminal opportunities.

Figure 2:1 – Routine Activities and Awareness Space


Cohen and Felson's (1979) RAT focuses on the way people move through time and space in their daily lives. For every crime to occur, the opportunity must exist, and such opportunities are contingent upon the way in which people move about in time and space. The way people move about the urban landscape influences opportunity
structures – it is how these opportunity structures influence the criminal event, which is the central premise to opportunity theories.

2.2 Environmental Criminology: A Theoretical Framework

2.2.1 Routine Activities Theory: Cohen and Felson

Cohen and Felson's (1979) RAT focuses on the way people move through time and space in their daily lives. Routine and daily movements create criminal opportunities when three elements converge in time and space: a motivated offender, a suitable target, and the absence of a capable guardian.

![Figure 2:2 - The Crime Triangle](image)

(Adapted from: Home Office, Crime Reduction, 2006.)

A motivated offender is one who has the desire to offend and the ability to fulfil those desires, a suitable target is something of value to the offender, and, the absence of a capable guardian refers to the absence of any individual\(^3\) who, through their presence, may deter a criminal act. Guardians in this regard are not necessarily the

\(^3\) A capable guardian could also be a security camera, animal, or the like.
police, but also individuals participating in routine activities, whose mere presence enables them to serve as guardians of property and of one another’s safety (Cohen and Felson, 1979).

Felson (1986) and Eck (1995) expanded the capable guardian element of RAT to include individuals directly involved with the person or place; this direct involvement deters crime: the former, intimate handlers (Felson, 1986) and the latter, place managers (Eck, 1995). Felson included the intimate handler concept into RAT by integrating components of Hirschi’s (1969) social control theory. Felson (1986) explains that in the lives of would-be offenders, there are individuals who exert informal social control preventing crime. For example, parents exert informal social control on their children, and while in their presence, they prevent the children or youth from engaging in criminal activity. When these individuals engage in criminal behaviour, it is because they have been able to evade the informal social controls exerted upon them by intimate handlers (Felson, 1986). Place managers are those individuals who either own the place in question, or are appointed by the owner to manage the place. These individuals, ideally, have the ability to control behaviour within the area and regulate who has access and in turn may prevent crime (Eck, 1995).

RAT is a macro-level theory. Originally, it was used to explain the increase of post-World War II crime rates in the United States (US). Cohen and Felson (1979) attribute the increase in crime rates to a change in societal routine activities, suitability of targets, and a reduction in the presence of capable guardians. The fundamental structure of US society was in flux; more women were in the workforce and the number of women in post-secondary schools increased, leaving the home unguarded. Moreover, targets themselves became more suitable with the advent of smaller, more valuable, portable electronics such as lighter televisions, radios, and the like (Cohen and Felson, 1979). Further, the suitability of a target includes two things, value and inertia. The more
valuable a target is, and the easier it is to transport, the greater the chance it will be desired by an offender. Felson and Clarke (1998) elaborated the target suitability construct to include visibility and access (how visible and accessible a target is). Clarke (1999) again refined the construct to include the CRAVED model:

C – Concealable: the offender must be able to easily conceal the item.

R – Removable: the item must be removable from its location.

A – Available: objects easily available are more likely to be stolen.

V – Valuable: easily transportable objects of value are appealing to thieves.

E – Enjoyable: the offender must be able to enjoy the stolen product.

D – Disposable: the object must be easily disposed of, for example easily sold.

This theory offers a good explanation for post-World War II crime rates, as they relate to burglary and theft (Felson and Clarke, 1998) and is readily applicable today.

Such an application is possible at the city level or a particular region of a city such as a downtown during specific times of the year, when that area sees regularly occurring spectator events, or even on a particular day when a festival occurs. As will be depicted below, changes in routine activities are hypothesized to occur during the Vancouver Canucks hockey season. Routine activities change at the city level when the Canucks play at home. On home game nights, 20 000 people converge on the downtown core to attend the game and many others frequent bars that (to watch) that televise the event. This influx occurs in accordance with the Canucks schedule and as such, if a consistent change in crime patterns is found, it may be predictable based on the hockey schedule. Theoretically, such an influx of people changes the opportunity for the motivated offender, suitable target, and capable guardian to converge in time and space.
2.2.2 Rational Choice Theory: Cornish and Clarke

RCT considers the offender’s decision making process, recognizing that the offender engages in a thought process before committing a crime. This process is affected by situational variables that vary by crime. Clarke and Cornish (1985) divided the process into four separate categories: initial involvement, the criminal event, continuance, and desistance. Within initial involvement, two processes emerge. The first is readiness; the offender has pre-considered several factors that led him/her to the conclusion that if the necessary opportunistic conditions are met, whatever they may be, then s/he will offend (Clarke and Cornish, 1985). The second decision occurs when factors, situational and otherwise, converge to give rise to crime opportunity. It is at this point the would-be offender decides to offend or not, a decision which may lead to the criminal event (Clarke and Cornish, 1985). For example, an individual may purposefully go downtown to General Motors (GM) Place area where they know many cars will be parked and would make suitable targets. It could be here that the offender sees the right car in the absence of guardians and decides to steal it. Or, alternatively, an individual may go to a bar to watch the game and consume alcohol. Typically, this individual may not engage in physical confrontations, but in this intoxicated state, perhaps instigated by a fan of a rival team may escalate to an altercation, as a result of a limited or constrained state of rationality influenced by an altered state of mind.

Continuance and desistance are exactly that, the factors that influence an offender to continue offending or desist. Continuance usually occurs due to positive reinforcement of the illegal act. In this case, perhaps an offender successfully steals cars during Canucks games, becomes a better thief, reduces the risk, progresses to steal nicer cars and turns a profit by selling them, which leads to financial dependence through illegitimate, rather than legitimate means. Other factors that result in continuance are thrill, such as the thrill of a fight, or involvement with peers who support
the activity. Regardless, the stimuli legitimate the criminal acts in the offender's mind, leading to continued criminal behaviour (Clarke and Cornish, 1985).

Like continuance, desistance is influenced by environmental and situational factors. Desistance may occur due to changes in the offender's life (age, family etc.), neighbourhood composition may alter target selection, the offender may abandon illegitimate acts for legitimate, or s/he may change the nature of criminal acts from auto theft to something more profitable, such as drug dealing (Clarke and Cornish, 1985). Perhaps the individual who engaged in a drunken bar fight was thrown into the drunk tank and learned his/her lesson and realizes it is inappropriate considering the individual has a family. Whatever the reason, it is important to note that desistance "may imply the cessation of all criminal activity, in other cases it may simply represent displacement to some other target (commercial premises rather than houses) or to another form of crime," or criminal activity may cease for a given period of time to resume at a later date (Cornish and Clarke, 1985, p. 173).

By understanding the thought process that offenders engage in, we may be able to understand why certain crimes are more likely to occur during certain time-periods surrounding the game. Such an understanding may allow police for example, to direct prevention programs to such specific processes, for example, increase the perceived risk of apprehension to deter theft.

2.2.3 Crime Patterns Theory: Brantingham and Brantingham

Pattern theory, like routine activities theory examines how people move about in time and space, and like rational choice theory is concerned with how environmental cues influence the decision process of the offender. Its concern is the spatial distribution of people in the environment and their movements and how these movements create criminal opportunities – the convergence of a motivated offender, suitable target, and the
absence of a suitable guardian. Recognizing the importance of routine movements about
time and space, Brantingham and Brantingham (1991) proposed that such movements
contribute to the factors influencing the offender's decision to commit a crime, including
environmental cues. The criminal event is an accumulation of a myriad of factors
including those stated in routine activity theory, but also includes a multifaceted decision
process that differs before each criminal event as proposed in rational choice theory
(Brantingham and Brantingham, 1991). Such a decision process varies by offender,
crime, motivation, and how the interpretation of environmental cues, "surveillance,
detectability, perceived risk and perceived rewards" (Brantingham and Brantingham,
1993b, p. 22) influences the decision regarding where and when to offend.

Crime pattern theory is a confluence of the theoretical elements of environmental
criminology preceding it. Brantingham & Brantingham (1993a) acknowledge that
numerous variables may influence and impact the criminal event. Central to CPT is the
environmental backcloth, which is composed of "uncountable elements that surround
and are a part of an individual and may be influenced by or influence his or her criminal
behaviour" (Brantingham & Brantingham, 1993b, p. 6). The backcloth is ever changing;
like a flag moving in the wind, from moment to moment as an individual moves about in
time and space, the factors that compose this backcloth are altered and change crime
opportunities (Brantingham & Brantingham, 1984; 1993b). These continuously changing
factors are infinite and may include, but are not limited to environmental cues, cognitive
abilities, desire and so forth, all of which influence the criminal event. Brantingham and
Brantingham (1993a) assert, "The likelihood of a criminal event transpiring depends on
the backcloth, the site, the situation, an individual's criminal readiness, routine activity
patterns, and the distribution of targets" (p. 266). Crime is by nature opportunistic and its
structured nature ensures that it is not random (Brantingham & Brantingham, 1993a;
Sherman, Gartin, and Berger, 1989). As people travel to and from nodes along pathways
to their intended destinations, the opportunity structures to commit crime change and so too the aforementioned factors influencing decisions of how and when to engage in criminal activities (Brantingham & Brantingham, 1993b).

Part of the backcloth is the process by which an offender interprets his/her surroundings and environmental cues to select a desired target, and one such cue is influenced by his or her familiarity with space. Criminals and non-criminals alike, become familiar with space through daily, legitimate activities. This familiarity is created through the accumulation of repeating daily activities in the same locales, or “activity spaces” (Brantingham & Brantingham, 1984). Activity spaces are composed of locations, called nodes, which are regularly frequented by an individual and include the paths used to travel to and from these nodes. Work, school, home, entertainment centres, and the paths between these nodes dominate this space (Brantingham and Brantingham, 1984). People tend to frequent the same activity nodes, routinely accessing them using the same paths. Routine use of these activity spaces allows people to create awareness spaces – spaces in which people are familiar. It is this process of familiarization that prospective offenders become aware of criminal opportunities. “People spend long hours in routine paths, travelling to and from work, school, shopping, entertainment. Paths determine where people search for criminal targets and where people are victimized” (Brantingham & Brantingham, 1995a, p. 11).

Awareness spaces extend beyond activity spaces because people are cognitively familiar with areas beyond where they are active. For an offender, the spaces that extend beyond activity spaces into the awareness space, and even perhaps slightly beyond, are termed action spaces, the areas in which offenders seek out suitable targets (Brantingham and Brantingham, 1984, 1991, 1993). These awareness spaces are not static; they change with changing activity spaces, and are different for each individual. For example, as people get older the number of activity spaces increases as well as
their awareness space. As a child grows up and learns to drive for example, activity and awareness spaces tend to increase dramatically (Brantingham and Brantingham, 1991).

Awareness spaces extend beyond individuals' activity nodes but the place where activity and awareness spaces literally end are called edges. Edges distinguish one area from another and may be physical or perceptual. A real, physical, edge could be a river or a highway, for example, while a perceived edge could be some cognition of an area beyond which one is comfortable and chooses not to venture. At edges it is difficult to differentiate between insiders and outsiders and it is at these edges where people unfamiliar with the area blend together. Such a convergence of people unfamiliar with one another and the environment around them can result in a higher occurrence of conflicts, such as racial attacks, assaults, or robberies. Such crimes occur because there are no shared expectations of proper conduct in said area. Preventing these crimes is difficult at edges because it is hard to distinguish insiders from outsiders and to remove those who do not belong (Brantingham and Brantingham, 1993b). These characteristics are present at facilities such as stadiums or shopping centres and the place where the criminal event occurs is just as significant as the process by which it is found.

The criminality of place is central to pattern crime theory. Not only does CPT examine where a crime may occur, but also when and how an offender may discover the location, why said location is suitable for the criminal event, and its relationship to the environment (Eck & Weisburd, 1995).

2.3 Spatial and Temporal Influences on Crime

Offenders and targets are not evenly distributed in time or space, and as a result, neither are crimes. As such, the criminal event will vary based on "the time of day, the characteristics of specific targets, and the site and situation surrounding the targets"
(Brantingham & Brantingham, 1993b, p. 262) and certain places or spaces and temporal periods are more likely to result in criminal opportunities.

Certain places known as crime attractors and generators are more conducive to criminal opportunities: attractors and generators bring together people who are unfamiliar with one another, as edges do, and may lead to an increase in crime at these locations. Crime attractors draw highly motivated offenders; they are specific places—neighbourhoods, or districts known to possess criminal opportunities, including entertainment districts, red light districts, drug areas, and the like (Brantingham & Brantingham, 1995a). A motivated offender may go to one of these areas for physical confrontation, to pick up a prostitute, or “score” drugs. These places may lead to serendipitous crimes as the offender may go for a particular purpose but then engage in unexpected forms of criminal behaviour because the opportunity presents itself (Brantingham & Brantingham, 1995a).

Crime generators differ in that they draw large numbers of people to a particular geographic area or place for the purposes of non-criminal activities, but during the course of the individuals’ presence and use of the facility, they engage in criminal behaviour. Generators include, for example, entertainment and shopping districts, central business districts (CBD), and stadiums among others (Brantingham & Brantingham, 1995a). Generators sufficiently change the backcloth revealing the necessary elements that coalesce affecting an individuals’ decision-making process, which results in the criminal event. Generators do not influence all individuals to commit crime; in fact, many will not interpret the environmental cues as conducive to the criminal event, while others will simply resist potential urges because they do not possess sufficient levels of criminal motivation (Brantingham & Brantingham, 1995a). Generators are not known to possess criminal opportunities like attractors, and therefore, crime created as a result may be unexpected and problematic for police.
Attractors and generators possess the necessary qualities that may result in the criminal event. A single location can be both a crime attractor and crime generator. Certain individuals may be attracted to a particular location for criminal purposes and others may be attracted to the same location for other purposes, but while there the necessary environmental cues emerge resulting in the criminal event. Bars are a prime example; most individuals go for legitimate activities, while ethnographic research has shown that some go specifically to pick a fight (Graham & Wells, 2003). Regardless of the attractor or generator, the commonality is that they change the environmental backcloth; environmental cues, the decision making process, and routine activities change such that when the opportunity presents itself, the motivated offender decides to engage in a criminal act.

Many spaces have been studied to assess their effects on crime. The place itself and the space within which a land use is located can have an effect on crime. Many studies of bars have been conducted across North America, England, and Australia, finding that the presence of bars will lead to an increase in violent crime (Block & Block, 1995; Briscoe & Donnelly, 2003; Fox & Sobol, 2000; Greenfeld, 1998; Kinney, 1999; Roncek & Maier, 1991) and disorder/malicious damage⁴ (Bonney, 1992; Bromley & Nelson, 2002; Ireland & Thommeny, 1993; Kinney, 1999; Roncek & Maier, 1991; Stevenson, Lind, & Weatherburn, 1998). Furthermore, areas possessing shopping centres (Kinney et al., 2008; Engstad, 1975; LaGrange, 1999), schools (LaGrange, 1999; Roncek & Faggiani, 1985; Roncek & Maier, 1991), public housing neighbourhoods (Roncek, Bell, & Francik, 1981; Roncek & Maier, 1991), transit centres (Smith & Clarke, 2000) and abandoned buildings (Spelman, 1992 as cited in Eck & Weisburd, 1995) have also been found to have higher levels of crime in the surrounding areas.

⁴ Malicious damage includes acts such as vandalism, graffiti, and other minor property crimes (Bonney, 1992)
Although the mere presence of the aforementioned attractors/generators is likely to lead to an increase in crime, the immediate context within which they are set also affects crime. For example, the geographic location of a school, if in a lower income area, also in combination with a high concentration of minorities is likely to have higher levels of disorder (Gottfredson, Gottfredson, Payne, & Gottfredson, 2005). Furthermore, higher student populations may also lead to increased crime (Gottfredson, 2001 as cited in Felson, 2002) due to the difficulty of distinguishing between legitimate and illegitimate users. Similarly, when schools are located close to shopping centres, crime in the immediate vicinity increases (LaGrange, 1999).

Situational variables in and around bars also have an effect on the extent of criminal occurrences. Researchers have found low guardianship within bars leads to higher incidents of sexual and violent behaviour (Fox & Sobol, 2000; Graham, Bernards, Osgood, & Well, 2006; and Homel & Clark, 1994) and higher outlet density of drinking establishments (Britt et al. 2005; Zhu, Gorman, & Horel, 2004) often increases the likelihood of the criminal event. Rossmo (1994) noted the proximity of drinking establishments to one another leads to an increase in violence and disorder, especially when the bars have common closing times because there is a higher likelihood of large numbers of intoxicated individuals congregating in the streets (as cited in Block & Block, 1995). The findings of these studies indicate that low guardianship, higher numbers of drinking establishments (alcohol outlet density) that are in close proximity to one another, especially with common closing times are likely to lead to an increase in crime. These variables often characterize downtown cores and at regular intervals, weekends for example, these factors change the environmental backcloth by increasing opportunities for the criminal event.

The greater social context in which a bar is located also has an effect on crime. Single and Wortley (1993) noted that bars in low income neighbourhoods whose patrons
are single, low-income, and male are likely to have higher incidents of crime, while Graham et al. (2006) found that bars located in suburban, rather than bar/entertainment districts were more likely to result in violence.

Areas along well-travelled routes also tend to have more crime because such routes makes finding suitable targets easier and more accessible for the offender, which leads to an increase in property crimes (Beavon et al. 2002). The placement of particular land uses such as convenience stores along commonly travelled routes and thoroughfares have been found to result in higher incidences of robberies (Duffala, 1976). Others have found that highly travelled routes used after bars exit have higher levels of disorder (Bromley & Nelson, 2002).

The above synthesis indicates there are many factors that come into play affecting the level of crime at these various crime attractors and generators. The spatial characteristics of these places affect crime occurrences. The mere presence of certain places, notably bars, schools, and shopping centres will lead to an increase in crime regardless of their location in the overall space. However, the level of criminality in these spaces can be added to, or detracted from, depending on temporal variants.

Just as certain geographic spaces are more conducive to criminal activity, so too are certain times. Time is an important component to criminal opportunity. As people move about time and space, conducting daily routines and activities, it affects opportunity windows. For example, the movement of people from their residences to work opens up the home for burglary, and criminals know this (Felson, 2006). Or for example, Felson (2006) notes that 62 per cent of purse snatchings happen between 06:00h and 16:59h, while 20 per cent of vehicle theft occurs during the same period (Felson, 2006). Certain types of crime are affected by the time of day and this affect may be attributed to free time.
People can only commit crimes during certain time frames; such opportunity windows are affected by an individual’s discretionary and obligatory time. Chapin (1974) explains “An activity is ‘discretionary’ if there is a greater degree of choice than constraint, and ‘obligatory’ if there is a greater degree of constraint than choice” (p. 38). In Chapin’s explanation, he is referring to those activities wherein different levels of choice exist. For example, eating and work would be obligatory activities, while watching TV and relaxing are discretionary activities (Chapin, 1974). In this case, discretionary activities would also include going to the bar or the hockey game. Discretionary and obligatory activities are further defined by time of day. For example, discretionary time/hours refers to non-working and non-school leisure times and are often during the evening and on weekends. It is during these discretionary times – and while engaging in discretionary activities – that the majority of crimes are committed (Brantingham and Brantingham, 2003). It follows that youth delinquency is more likely to occur outside of school hours (or obligatory activities) (Gottfredson, Gottfredson, & Weisman, 2001), which is in keeping with the intimate handler concept of RAT. These handlers, whether they are parents, employers or teachers exert a form of social control, and while this control is exerted on the would-be offender, criminogenic behaviour is suppressed (Eck, 1995; Felson, 1986).

It is during discretionary times that handlers cannot exert social control, leading one to believe that crimes are more likely to occur during hours in which many people have discretionary time, such as evenings and weekends. As such, crimes are affected by many temporal variations or social routines, including “the school day, pub opening hours, the work week, the school year, vacations in August, a two-week holiday around Christmas, issuance of welfare cheques on the third Wednesday of the month — make up the physical and social backcloth that "structurates" human activity” (Brantingham &
Brantingham, p. 125) and these temporal variations occur at many levels of human activity.

Temporal effects on crime have been found at many levels. At the macro level, societal variations in crime in the post World War II era were noted by Cohen and Felson (1979) and Brantingham and Brantingham (1984) explored many yearly trends. Temporal variations at the monthly and seasonal level have been well documented years. As far back as the 1830s, Guerry found that France saw an increase in violent crime in the summer months (as cited in Harries, Stadler & Zdorkowski, 1984). Other discussions include (but are not limited to), Quetelet’s *Thermic Law of Delinquency* ([1842], 1968), Ferri (1896), Lombroso (1911), Aschaffenburg ([1913] 1968), Parmelee, 1926, and Hawley (1950), for example. More recent studies include: Harries et al. (1984), who found seasonal variations in assault in Dallas; Farrell and Pease (1994) found seasonal effects in Merseyside; and Hird and Ruparel (2007) of the Home Office found several seasonal trends in England and Whales – assaults, sexual assaults and arson, peaked in the summer, while residential burglary peaked in the winter months.

Temporal effects at the daily and even hourly level have also been explored. Extant research has found higher levels of violent crime typically occur on weekends. Homicides (Ceccato, 2005; Lester, 1979), assaults and other violent crimes (Briscoe and Donnelly, 2001, 2003; Harries et al., 1984; Nelson, Bromley, and Thomas, 2001; Shepherd, 1990; Wagner and Almeida, 1979), robberies (Cohn and Rotton 2000), rape (Cohn, 1993) vehicle thefts (Rengert, 1997), and malicious damage/disorder crimes (Bonney, 1992; Nelson et al. 2001) occur at higher rates on weekends. Within these analyses higher levels of violent crimes occur on Saturdays (Harries et al. 1984 and Nelson et al., 2001) and holidays (Cohn & Rotton, 2003; Lester, 1979).

Studies have gone further to examine crimes and specific time of day. Generally, late night and early morning have peaks in crime. Shepherd (1990) found that males
were more likely to be assaulted between 20:00h and 03:00h on Saturday and Sunday, while women were more likely to be assaulted between 09:00h and 20:00h in Bristol. Nelson et al. (2001) found that violent crime spiked in the late evening and early morning on weekends with the peaks between 23:59h and 03:00h but was dependent on location and land use. Briscoe and Donnelly (2001) found an increase in assaults near licensed premises between 21:00h and 03:00h with a peak between 00:00h and 03:00h and that this peak was accentuated when alcohol was involved (2003). The explanation for such findings relied on routine activities and the implicit notions of discretionary time as these are all hours where opportunity structures dramatically change because there are increased chances of the motivated offender, suitable target, and lack of a capable guardian converging in time and space, often after entertainment ends and possibly under the influence of alcohol.

Similar studies have been conducted on other crimes; Cohn and Rotton (2000) found a peak in robberies on Saturdays between 21:00h and 03:00h and higher reports of burglaries on workdays between 09:00h and 14:59h. Ratcliffe (2004) found an increase in burglaries between 23:00h and 03:00h, and an increase in vehicle thefts between 12:00h and 18:00h. Finally, Bonney (1992) found that a great deal of malicious damage was committed on the weekends overnight, between 21:00h and 05:00h and Ireland and Thommeny (1993) found that street offences including malicious damage occurred between 22:00h and 02:00h.

The criminal event is dependent on the distribution of offenders, targets, and guardians, each of which are affected by time and space and certain times and spaces are more opportune for certain crimes because of how they affect the environmental backcloth (Brantingham & Brantingham 1993b). However, the environmental backcloth continually changes revealing opportunities for other crimes at different times. Cohn and Rotton (2000) found higher levels of theft during the late afternoon and early evenings.
on workdays (Monday – Friday) potentially due to discretionary times of juveniles as they are let out of school. Rengert (1997) found auto thefts in Philadelphia typically occurred at night, but explained reports to police based on routine activities and time of day. Evening thefts were attributed to bars and occurring outside the victims home, while many daytime thefts were attributed to school/college parking lots and tourist attractions (Rengert, 1997). Similarly, Hope (1987) found that 78% of auto crimes occurred between 18:00 and 06:00 in the United Kingdom.

The above discussion has shown how space and time affect criminal opportunity. These variables, however, are not mutually exclusive. There is always a spatio-temporal component to any crime and it affects opportunity structures. The commonality between the trends examined above is that whether the crimes are interpersonal, vehicle, or disorder/damage crimes, all of which are influenced by potential crime attractor or generator effects, which result in higher crime opportunities and suitable targets. On weekends when bars let out, there are more people in one geographic location (attractor or generator), which may result in interpersonal conflict; these same people may find opportunities to vandalize something on their way home from the bar; and shopping malls during the day attract more vehicles to them, and in turn act as a crime attractor for vehicle crimes. In these cases, a particular place or space brings together a large number of targets and offenders, thereby increasing the opportunity for crime. But questions remain about those spectator events that draw large numbers of people into the same geographic region?

Cohn and Rotton (2000) examined the effects of festivals on crime, finding that during these times crimes increased. However, much of the extant research on spectator events and crime has focussed riots and crowd violence as a result of sporting events (see Mustonen, Arms, & Russell, 1996; Roberts & Benjamin, 2000; and Russell, 1995, 2004 for example). Soccer hooliganism is a source of a lot of European research
surrounding spectator events (Dunning, 2000; Junger-Tas, 1996; and Trivizas 1980). Other research examines how the sporting event itself leads to brawling involving players and fans and the effects of sport violence on greater society (see Fields, Collins, & Comstock, 2007 for a review of literature). Suicides were also found to vary with the success and failure of local sports teams (see Curtis, Loy, & Karnilowicz, 1986; and Trovato, 1998 for example).

The studies above did not focus on how such events affect crime patterns; however, such research has been conducted on football in the US. The popularity of football in the US is analogous to the popularity of hockey in Canada. Rees and Schnepel (2008) examined the effects of College football games on crime across the US using the National Incident Based Reporting System for 2000-2005 in 26 locations. The authors found an increase in assaults, vandalism, liquor law violations, driving under the influence, and disorderly conduct on game days (Rees & Schnepel, 2008). Similarly, Lin (2007), in an exploration of the effects of a professional football team’s games, found that overall, there are higher levels of crime on game days than non-game days. Specifically, Lin (2007) found an increase in burglaries at the city level, and a small increase in theft of auto and auto theft in the area surrounding the stadium on game days. She also found incidents of robbery were not affected by football games. Lin’s (2007) study examined a Northwest city – Seattle, which is suggested elsewhere to be similar to Vancouver for crime comparison purposes (Gordon & Kinney, 2006).

White, Katz, & Scarborough (1992) used emergency room visits for assaults to determine the effects of Washington Redskins games on spousal violence against women from 1988-1989. White et al. (1992) found no correlation between emergency room visits and game days, however, a slight increase was found when the Redskins won on home game days. Using calls for service (CFS) from the Los Angeles Sheriffs Department, Sachs & Chu (2000), found an increase in CFS for domestic violence with
the timing of professional football games for the 1993-1994 season, however, these findings were not statistically significant.

Football games are not the only events that have resulted in an exploration of their effects on crime. Phillips (1983) found an increase in the US homicide rate in days following prize fights for 1972-1978. In a reanalysis of Phillips work, Miller, Heath, and Molcan et al. (1991) confirmed these findings while conducting more in depth statistical analyses. Tavella (2007) indicated that there is anecdotal evidence that sex tourism increases during large-scale international events such as the Fédération Internationale de Football Association (FIFA) World Cup. In Germany, 2006, media outlets reported, although unfounded, that they expected upwards of 40 000 women and children to be brought to the country to service fans (Tavella, 2007). Hall, Selwood, and McKewon (1995) explain that during the 1987 America’s Cup in Western Australia, there was an increase in private prostitutes and escorts. Ryan and Kinder (1996), assert that engaging with sex trade workers can occur whenever tourism exists, not merely during special events. Hall et al. (1995) and Barker (2004) found that the 1987 and 1999-2000 America Cup in Western Australia and Auckland, New Zealand both resulted in higher than average occurrences of violent and property offences and disorderly behaviour.

Barker (2004) notes that events such as the Olympics can lead to crime because it brings people together who have no ties to the area, who therefore, may engage in disorder or mischievous crimes. He further explains that such venues have resulted in large-scale demonstrations such as in the 1981 Springbok rugby tour (or current protests against the 2008 Beijing Olympics (BBC Online, 2008)). Furthermore, Barker (2004) explains the Olympics have seen terrorist attacks (for example, Germany, 1972) and that organized crime syndicates may target the Olympics to prey on unsuspecting tourists (for example, Sydney, 2000). Barker’s findings could be attributed to edge effects in that
it is difficult to differentiate between legitimate and illegitimate users making it hard to remove those who may engage in criminogenic behaviour.

Decker, Varano, and Greene (2007), explored the effects of the 2002 Salt Lake City Olympics on crime patterns by examining CFS before, during, and after the Olympics. The total numbers of CFS examined showed a negligible increase, roughly 2 per cent from the weekly average (of 73 weeks prior) during the games and a 3 per cent increase after the games. When examining actual incidents and arrests, figures for the time frames preceding and following the Olympics were very similar, but the two week period of the Olympics were hosted saw higher levels of incidents and arrests (Decker et al., 2007).

Within the above studies, most did not use theories of environmental criminology to explain their findings. Psychological explanations described domestic violence (White et al. 1992; Sachs & Chu, 2000), the depiction of media violence was used to explain increases in homicides after prize fights (Phillips, 1983; Miller et al. 1991), and the accounts of tourism and crime offered little theoretical foundation as to why these phenomena occur, but instead focussing on the fact that they do exist (Barker, 2004; Tavella 2007).

However, Ryan and Kinder (1996) explain that tourist engagements with prostitutes may be explained through RCT because it creates an opportunity for the individual, who may become initially involved in the activity during the vacation and then desist at the end of the vacation. Furthermore, the vacation occurs in a location where the elements of RAT may converge in time and space. Lin (2007) explained that on game days vehicle crimes increase because of the increased availability of suitable targets in the vicinity of stadium for motivated offenders. Finally, Decker et al. (2007) assert that the Olympics may result in an increase in crime due to the potential for the motivated offender, suitable target, and lack of a capable guardian to converge in time
and space. The authors added the attractor/generator concept to this explanation, indicating that the Olympics may act as both an attractor and a generator for crime. This assertion is particularly interesting when Barker’s (2004) commentary is taken into consideration as large-scale international events may act as crime attractors for organized crime to prey on tourists (and terrorism).

The above synthesis of the criminality of place and time exemplifies how the interaction of these variables at different times, places, and magnitudes may alter the environmental backcloth and affect opportunity structures. These variables affect the ability of targets, the lack of guardians, and the motivated offender to come together, illustrating that when this occurs in greater numbers, crime is likely to occur. However, these studies did not specifically address is the activity that is occurring in these venues.

We know that the place itself, that is, its location, the surrounding geographical features, and the variables on the backcloth – all have an impact on the output of crime by an attractor/generator. What remains largely unexplored is how the activities within those attractor/generators affect crime occurrences. Such activities may include bars hosting sporting events or certain locales within a where street festivals are held. Venue and activity change the environmental backcloth. The type of clientele attracted to the establishment or locale changes as a result of the type of activity, in turn, further altering crime opportunities. Whether or not an establishment becomes an attractor or generator and to what degree depends on the clientele it attracts, because some populations are more likely than others to take advantage of criminal opportunities arise or are identified.

The population at risk inherently affects the crime type and amount of said crime. The fewer the targets, the less likely it is for the crime to occur, and if there are no targets for a particular type of offence, the offence cannot occur. The population at risk is literally the population that is at risk of targeting, whether this represents an individual to be assaulted or a vehicle to be stolen. The criminal event is dictated not only by the
motivated offender, but also by the availability of targets, both of which are influenced by attractor/generator affects created by spectator events. These events change the environmental backcloth and, in turn, the availability of targets will change and increase, and thus, the particular type of attractor or generator can affect criminal outcomes.

Parallels may be drawn between the population at risk and a discussion of crime rates. It has been noted time and time again in discussions of crime rate calculation that the denominator must reflect either the population at risk, or the opportunity (Boggs 1965; Clarke, 1984; Frisbie et al., 1977; Gottfredson, 1981; Harries, 1991; Schmid 1960). Traditional crime rates are calculated through residential population, but as Boggs (1965) explains, this can be problematic if you are interested in the rate of burglary. For example, the residential population is not indicative of the number of residences available to be burglarized. As such, an appropriate denominator would be the number of residences that may be burglarized.

The latter has to do with absolute exposure, that is, “those characteristics of persons, objects, time, or space that are logical requisites for the occurrence of a specific form of criminal victimization. Without absolute exposure a crime cannot occur” (Gottfredson, 1981, p. 715). Logically, if an individual or his/her property is not within the geographic area, the person/property is not at risk of targeting. A fluid population in a particular geographic region can affect the absolute exposure, and in turn, the spatial distribution of crime (Schmid, 1960).

As will be explained below, the study area, Vancouver’s downtown core has a very fluid population because it has a significant residential population, as well as business and entertainment districts. This results in a significant number of people entering and leaving the core and in result, the criminal opportunity and absolute exposure are in continual flux and the backcloth is ever changing. While the focus of the

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5 For a detailed discussion of alternative crime rate denominators, see Harries 1991.
aforementioned authors was the crime rates and denominators, these are not calculated in the subsequent analysis, however, the points made by notably, Boggs (1965) and Harries (1991) serve as a useful foundation for a discussion of how criminal opportunities for the identified crimes of interest are affected when the population at risk changes as the spatio-temporal levels.

When a spectator event occurs, the populations, both criminal and non-criminal change, thereby altering crime opportunity. The particular attractor/generator in question affects the population at risk, but within that attractor/generator, the particular activity will also affect the population because certain activities are more or less attractive to certain criminal and non-criminal populations, which in turn affects opportunity structures. As such, we must examine how a particular activity in the attractor/generator in question may affect criminogenic behaviour. For example, certain sports have different types of fans and some are more passionate and dedicated to the local team than others while others are simply rowdier (e.g. soccer hooligans). The cost of attending an event can affect the type of person who attends (Decker et al. 2007). The degree to which fans are emotionally involved with the team may affect their behaviour. For example, Trovato (1998) insists that Quebec has some of the most passionate hockey fans in all of Canada and as such, the success of the Montreal Canadiens, affects the suicide rate. Therefore, we may expect rowdier behaviour from Canadians fans that may go so far as being affected by the outcome of a game, such as the recent mini-riot seen in Montreal after the Canadians won game seven in the Stanley Cup playoffs advancing them into to the next round (Menie, 2008).

The research into this area of crime attractors/generators is sparse and not yet theoretically defined but such a theoretical development has broad applicability. It may be applied to the bars and pubs: for example, when bars have particularly popular events, they may attract certain types of clientele which may in turn lead to an increase
in crime. Fox and Sobol (2000) found that inducements of cheap drinks or "ladies nights" led to an increased chance of physical or sexual victimization if patrons came unaccompanied. Block and Block (1995) found that bars with high incidences of aggression showed boxing on television and held mud-wrestling spectacles frequented by young college students. When such activities occur regularly, they may change routine activities on a more macro level, which affect crime patterns. For example, if a bar shows Ultimate Fighting Championship (UFC) matches, every month, the bar may attract a particular clientele who may drink, get rowdy, and engage in aggressive activity from trying to mimic what they see in the UFC bouts resulting in higher assaults on these days. Alternately, if the opera is on, it is not likely that this will generate increased rates of violent behaviour, but there may be increases in parking-lot-related levels of vehicle crimes. Similar assertions can be made when bars regularly show sporting events such as hockey, which may be particularly problematic in cities where sporting events are shown at bars in close proximity to the actual venue, such as a downtown core.

Brantingham and Brantingham (1995a) identify several places within Metro Vancouver that may be considered crime generators such as "the downtown core; the Granville Island shopping and theatre district; the stadium complexes on False Creek; [and] the Metrotown complex in suburban Burnaby" (p.7). Particularly pertinent to this analysis is the identification of stadiums and the downtown core as attractors/generators. These locations allow for an amassing of a large number of people into one geographic area and specifically a geographical location, GM Place. Such locations affect the criminal and non-criminal populations and create an opportunity for crimes by allowing the necessary elements for the criminal event to converge in time and space at a

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6 UFC is a mixed martial arts league where men fight each other to the point of submitting or knocking out one another and is as violent if not more violent than boxing.

7 I have personally viewed this type of behaviour while attending a UFC event in a local bar.

8 Oftentimes bars in Vancouver's downtown will show the Canucks games on T.V., especially when these games are only available on Pay Per View, which is a frequent occurrence.
particular time in a particular space (Brantingham & Brantingham, 1995a). Although individuals, offenders and non-offenders alike, have congregated at these generators, it does not necessarily mean there will be an increase in crime. But, such places increase the opportunity for a motivated offender, suitable target, and the absence of capable guardian to converge in time and space that results in the criminal event (Brantingham & Brantingham, 1995a) and this possibility occurs regularly when the Vancouver Canucks play at GM Place.

The purpose of expanding the attractor/generator concept coupled with the discussion of populations at risk is to add another level of analysis to existing research. By examining the activity occurring in the identified space, whether it is "big fights," sports events, or an opera performance, we may be able to estimate the type of person(s) that may frequent this space. Because we know that certain populations are at a higher risk of crime (as victims and offenders), we may, in turn, be able to predict patterns of crime when such events occur and help the police allocate resources accordingly.
CHAPTER 3: DATA AND METHODS

GM Place, located in Vancouver’s downtown core has a capacity of approximately 20,000 and attendance has reached capacity during nearly every home game since the 2000/2001 season (NHL, 2007, Online). Like GM Place, the downtown core on home game nights also acts as a crime attractor/generator as people frequent bars in the vicinity where they can view the game. In result, home game nights may draw in excess of 20,000 people to the downtown core, which will likely result in a change in crime patterns. When the Vancouver Canucks play, at home or away, peoples routine activities change and the environmental backcloth is altered, both spatially and temporally, and as a result, there is likely to be an affect on crime patterns in the downtown. People enter the downtown core to watch the game at GM Place or at a bar perhaps, which draws people and vehicles to the core. This congregation of people in the city centre changes opportunity structures by increasing the likelihood that the motivated offender, suitable target, and lack of a capable guardian converge in time and space.

The purpose of this study is to examine the effects of spectator events on crime patterns, and therefore, riots that have resulted from hockey games and other spectator events will not be examined because they are isolated events. Aside from the “Rocket Richard” riots in the 1950s in Montreal (CBC, 2005, Online), Roberts and Benjamin (2000) found that there were five hockey riots over 20,000 games played in the previous 20 years. One was in Vancouver in 1994 after the Canucks lost in the Stanley Cup final and in Montreal in 1989 and 1993 when the Canadiens won the Stanley Cup (Roberts & Benjamin, 2000). Since then, there have only been two outbursts of fans (2004) in
Calgary after the loss of the Stanley Cup and in Montreal (2008) after advancing to the next round in the Stanley Cup playoffs. These riots indicate the potential effects of hockey games on spectators. Fans can get so involved in games that it may result in violent behaviour at the game, at the bar watching the game, or simply in the downtown core after the game. This analysis is concerned with how actual patterns of crime are affected and hockey riots will not be included in the analysis because they are isolated incidents. Furthermore, it is expected crimes that occur during the event itself are often dealt with by in-house security who eject the individuals from the venue and do not use the legal system (Russell, 2004) thereby contributing to the dark figure of crime.

As such, the data presented below are directed towards examining the effects of the Canucks games on crime patterns, not riotous behaviour. The analytical possibilities with these data are numerous are necessarily limited due to the scope of this thesis. This analysis examines variations in crime on home-game days versus away-game days versus non-game days. The specific crimes of interest in this analysis are assault, theft from auto, motor vehicle theft, and disorder as the literature has shown these crimes are most directly related to spectator events.

### 3.1 Data Sources

These data include the Vancouver Police Departments (VPD) incident data from the computer aided dispatch CAD database, (derived from 911 calls for service), Vancouver Canucks “Game by Game Reports”, data from the Liquor Control and Licensing Board of BC (LCLB), and population data from Vancouver’s Planning Department.

These different data sources allow for a multi-level analysis of how the presence of a Canucks game at home, away, or the lack thereof, affects reported incidents. These effects are examined below on the day, game-time, and hourly level, and how these
effects are geographically distributed throughout Vancouver's downtown core. The central premise here is that game day types and the geographic space in the downtown changes the opportunity structures for the criminal event.

3.1.1 The Study Area

To examine the effects of spectator events on crime patterns, this analysis uses the Vancouver Canucks and Vancouver's downtown as a case study. The Vancouver Canucks are the local National Hockey League (NHL) team, located in Vancouver, British Columbia (BC). The Canucks play on a scheduled, regularly occurring basis, and are therefore designated as routinely occurring spectator events.

Metro Vancouver is composed of approximately fifteen municipalities that surround Vancouver, but Vancouver proper is bordered by Burnaby, West Vancouver, North Vancouver, and Richmond. People from all over Metro Vancouver regularly commute to different municipalities for work, entertainment, shopping, and the like – this is particularly true for the downtown core. People from all over Metro Vancouver enter the downtown core for the aforementioned reasons while conducting daily routine activities. Conversely, many residents of the downtown will leave the core to go to other locations within Metro Vancouver for the same reasons. This movement of people in and out of the downtown results in a criminal and non-criminal population that is continually in flux. This fluidity continuously changes the environmental backcloth, and in turn, criminal opportunities.

The downtown core (as seen in Figure 3:1 below) as defined by the City of Vancouver has twelve identified neighbourhoods, one of which is East Downtown. There is an area within East Downtown, the Downtown Eastside (DTES), which is plagued with crime. The DTES is a unique area within the downtown core possessing crime opportunities unlike anywhere else in the city, which acts as a crime attractor for drug
crimes, prostitution and to buy and sell stolen goods (Dandurand, Griffiths, Chin, & Chan, 2004). It is viewed as a dangerous place to many outsiders. The current East Downtown borders include Gastown, a historic area of Vancouver, which attracts people to view the architecture or frequent its shops and restaurants (Gastown, 2008, Online). Personal awareness of both of these areas lead to a decision to create an space and cognitive map that does not include the area of Gastown in what may be considered the more dangerous DTES. It is the DTES that is to be eliminated from this study, because it is that area that outsiders will not likely frequent to watch hockey games and as such, the borders of Central Waterfront and East Downtown depicted in Figure 3:1 were changed to reflect this awareness space.

Figure 3:1 – Downtown Vancouver Neighbourhoods

(Adapted from: Vancouver Planning Department, 2006, Online)

East Downtown (now the DTES) and Central Waterfront are the only boundaries that have been physically altered for this study. The remaining neighbourhood
boundaries were simply merged from the original boundaries defined by the City of
Vancouver's Planning Department to reduce the number of neighbourhoods for reasons
explained outlined above. The revised neighbourhoods are 1) Central Business District
(CBD), 2) Central Waterfront (expanded), 3) Downtown South, Bridgehead (Downtown
South), 4) False Creek North, Yaletown, Granville Slope, and Citygate, (False Creek
North); 5) West End, Triangle West, Bayshore Gardens and Coal Harbour (West End),
and the DTES (although not included in the study). 9

Figure 3:2 – Redefinition of Downtown Neighbourhoods

9 It should be noted that Chinatown is located within the neighbourhood boundaries of False Creek North
and the DTES. Chinatown may also act as an attractor/generator in the downtown, but this effect is not
examined in this study.
3.1.2 Study Period and Data

The study period for this analysis was dictated by the availability of the Vancouver Canucks season data. Data was obtained from the NHL’s website through the “Game by Game Reports” from http://www.nhl.com/nhlstats/app. Data are only available from the 2000/2001 season to the 2006/2007 season, which became the time frame of analysis. It should be noted that no data exists for the 2004/2005 season because there was a player lockout, which resulted in the cancellation of the season. These data include such fields as date and location (home or away) of the game, opponent, score, and attendance records, all of which are available for both regular and post-season.

The second data source is the VPD CAD data, which were provided to the Institute for Canadian Urban Research Studies (ICURS) in the School of Criminology at Simon Fraser University (SFU), which allowed access. As mentioned above, the period of analysis is the 2000/2001-2006/2007 seasons, excluding the 2004/2005 season. However, given that CAD data are available for what would have been the 2004/2005 season, it is used for comparative purposes to explore the effects of Canucks games on crime patterns to a season wherein the Canucks did not play at all.

The advantage of the CAD data is its raw form. It is incident level data and includes several fields; the primary fields of interest are the INC, which is the incident type, and the ENTERDATE, that is the day the call was entered, and the ENTERTIME, which is the time the call was entered. As such, it permitted altering the data for specific analytic purposes.

Once the study period was identified, the datasets were merged. The beginning of the regular season and end of the Canucks season (regular or playoffs) was identified and designated as the season for that year. The corresponding dates within the CAD data were identified as the CAD Season (e.g., 2000/2001 CAD Season) and because
this analysis is exclusive to the hockey seasons, all other dates were omitted (typically sometime in April or early May through the beginning of October).

The CAD Seasons were then geocoded using mapping software, ArcGIS. The geocoding resulted success rates of 95 per cent and above for each season of study. The effect of geocoding the data is to map out the locations of the CFS, which were then selected out to include only the downtown core as defined by the Vancouver Planning Department, thereby isolating all CFS within the study area because it is thought that the Canucks games will have the greatest impact on crime trends in the downtown core (the CFS for the DTES was later removed).

These CFS are address level data and of a sensitive nature. As such, the data had to be anonymized through aggregation to the dissemination area (DA) level. For Census purposes, Statistics Canada divides the country into different units. The smallest level is the DA. DAs are “small, relatively stable geographic unit composed of one or more blocks. It is the smallest standard geographic area for which all census data are disseminated” (Statistics Canada, 2007b, Online). In doing so, all CFS were associated with a DAUID, a DA identification number, which has the effect of removing all address level identifiers, consequently anonymizing the data.

Once the CAD seasons data were aggregated, it was merged with the Canucks season data. This was done through a table join, which joins two tables based on a common field, in this case, the date field. This process was completed for each of the CAD seasons. By linking the CAD data to the Canucks data, the CAD data and CFS are associated to the days that the Canucks played at home or away, in turn creating a variable game day type including: “Home”, “Away”, and “Non-Game” days (calls not associated with home or away game day became non-game days).

From this point, the dataset was modified for analytic purposes. The dates were identified by the day of week, hour and game time. The “Weekday” field was created
through the “weekday” function in Excel, which enables the user to determine which day of the week a numeric date is through assigning each day a number. In this case, Monday = 1 and Sunday = 7 and from there, an “If” statement was used to label each day Monday through Sunday. Through examining the ENTERTIME field, each entry was associated with the hour in which the call was made, 00:00h to 23:00h.

One final time modification was made using the ENTERTIME and the game day type, this was to create a game time variable. The pre-existing game day type, which indicates if the day is a home-game, away-game, or non-game day but from 00:00 to 23:59:59h. For the game time field, each day was manually assigned a 1, 2 or 3 based on game day type at 17:00h on that day. Times range from 17:00h to 04:00h the subsequent day received the same classification. For example, if the game day type field indicated a home game day on October 10 then from 17:00h-23:59h of that day received a 1 as did 00:00h-04:00h on October 1.

The rationale for this recoding classification is that as people enter the downtown to engage in game-day related activities, they do not stop at 23:59h of that day: it is quite possible that people go downtown, watch the game, and may remain for entertainment purposes into the morning hours of the next day. 17:00h was selected because it is typically two hours prior to game start (19:00h) which gives people time to travel downtown during which, crimes may occur. 04:00h was selected because many bars may not close until 02:00h and selecting two hours after closing gives people time to exit the bars and make their way to their next destination.

The next step was to recode the variables for analysis. Because the CAD data includes several different CFS, the “INCTYPE” field had to be recoded to “IncidentType” which included the crimes of interest (COI). The crimes of interest were identified as assault, Disorder, vehicle theft (VT), and theft from auto (TFA). These are scale variables because there are multiple calls that fit into each category and there was a
change in the INCTYPE variables throughout the years in the CAD data. A concordance table, provided by the VPD, was used to identify the CFS as falling into one of the aforementioned categories. The scales are as follows: assault, is composed of ASLT, ASLT1, PASLT, PASLT1, ASSA, ASSAI, KNIFE, PKNIFE, ASSAW, ASSAWI, WEAPI, STAB, PSTAB, PFIGHT, FIGHT, PGUN, and GUN. Vehicle theft is composed of the calls for service STAUTO, PTHEF1, THEFVI, BAIT, PVEHS, and THEFV. Theft from auto includes TFAUTO, PTHEFA, and THEFTF. Finally, Disorder, is composed of ANNOY, PANNOY, PANHA, KPEACE, PKEEP, NEIGHD, ASSISG, MSCHF, PMISC, MISCH, MSCHF1, MISCI, MISCHI, NOISE, PNOISE, DISTN, DISTP, PROST, and PPROST. Once identified, the CFS were recoded into a new variable, “Incident Type” into the above categories. All remaining CFS falling outside of these categories were designated as “Other”.

These variables were chosen because as described above, it is well known, that bars and alcohol tend to lead to violent behaviour of varying degrees, that an amassing of vehicles creates a hotspot for theft from and of auto (Barclay, Buckley, Brantingham, Brantingham, & Whinn-Yates, 1996), and disorder as the aforementioned studies have indicated because of an attractor/generator effect. However, the studies mentioned above did not indicate how disorder was measured; for this study disorder will be measured using a scale created by mischief, public drunkenness, by-law violations, littering, and noise complaints, as was suggested by Professor Paul Brantingham (personal communication, December 7, 2007). These calls are thought to be more consistent than drug or prostitution calls, because such crimes are more susceptible to police discretion and initiation; therefore, they were were omitted from this category. The

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10 See Appendix D for a description of the call types.
11 This recode was conducted through using an “If” statement in MS Excel. Please see appendix A for the formula.
variables for disorder were selected out of the CAD data to match Professor Brantingham's suggestions as best as possible.

Once the temporal and CFS recoding were complete, the data were prepared for the spatial component of the analysis. Doing so required associating each record within the dataset with a neighbourhood boundary that corresponds with Figure 3:2 above. This resulted in creating a new field, “NBHD Zone.” This process associated each DAUID with the neighbourhood zone it fell into. The first attempt was done with the Planning Department’s original boundaries, but failed because many of the DAs overlapped with the smaller neighbourhoods. The solution to this boundary problem was to change the neighbourhood boundaries of the study area.

The problem identified above is one of the reasons that the downtown neighbourhood boundaries are used instead of DAs and why they were merged from the original Planning Department’s boundaries. Like the DAs some of the neighbourhoods identified by the Planning Department were too small for analytic purposes and oftentimes a DA crossed the boundaries into another neighbourhood. Therefore, the neighbourhoods were merged or reshaped, as in the case of Central Waterfront and East Downtown. To reiterate, the new boundaries are: 1) Central Business District, 2) Central Waterfront, 3) Downtown South, 4) False Creek North, 5) West End and 6) DTES (excluded). The DAs were then successfully associated with a neighbourhood boundary. The next step was to join the CAD Season dataset with the new NBHD Zone table and the data were joined through the field DAUID. The new neighbourhood boundaries were shown in figure 3:2 above.\footnote{Note that census tracts (CTs) are similar to DA’s but are larger (Statistics Canada, 2007a) and could have been used instead of these neighbourhood boundaries, but the neighbourhoods have a contextual meaning whereas CTs do not.}

It should be noted that the process for the 2004/2005 lockout was different. Because the season was cancelled, dates had to be chosen for the start and end dates.
of the season. To determine the start date of the lockout season an average of the start
dates was taken which ranged from starting on October 4 through to October 10. It was
determined that the start date for the lockout season is October 6, 2004. A similar
method was used to determine the end of the Canucks season. To determine the start of
the playoffs, an average of the start date of the playoffs was used which resulted in the
start date being April 11, 2005. The average number of playoff season games over the
six study years, was found to be 6.83, or rounded, seven. The Canucks typically played
a playoff game every other day and as such, with a playoff start date of April 11, the end
of the lockout season for the Canucks is April 23, 2005. The lockout season for the
purposes of this analysis spans from October 6, 2004 to April 23, 2005 (Note: In using
the average of the start of the overall Playoff season the days are about the same, with
overall start average being 12.66). The same variables added to the CAD seasons
dataset were then added to the lockout dataset.

In conducting any sort of temporal analysis, limitations emerge due to the nature
of the analysis. One problem is the ENERTIME and ENTERDATE of the crime, which
is the time and dates the calls are entered. Ratcliffe (2002) explains that problems arise
surrounding when a crime should be entered. For example, should a crime be entered at
23:58 on one day if it finishes at 00:03 the following morning. This may become
problematic when conducting daily or weekly analyses (this was dealt with below by
recoding the game day types). Another problem that arises with temporal analysis
occurs when examining crimes such as burglary in that these crimes often do not have
witnesses and thus, the exact time of the crime cannot be recorded precisely (Ratcliffe,
2002). These crimes are usually reported when someone discovers that they have been
committed – which could be hours or even days later. While it is often the case for
burglaries and thefts, it could be a complication for disorder crimes generally (Ratcliffe &
It should be further noted that there are missing data: March 3, 2001, October 5, 2006, and nine days from the end of the 2005/2006 season. As such, the total dataset consists of 234,329 CFS with 203,736 belonging to the hockey seasons and 30,593 CFS for the lockout season.

Another issue that arises is that the ENTERTIME/ENTERDATE is often different from the CLOSETIME/CLOSEDATE (the time and day when a call has been “cleared”). Of 234,328 entries, 3,449 do not have the same enter and close dates and span all crime types. Given the nature of this exploratory analysis, the ENTERTIME was used to determine if there is a pattern worth investigating in the future.

It should also be noted that these are all the available data for the time period in question, however, given there is always the dark figure of crime, there is no way to know how much of the crime occurring is actually reported (Brantingham & Brantingham, 1984).13

3.1.3 Populations at Risk

Estimating populations at risk, particularly at the neighbourhood level is no easy task. Measuring the number of people who come and go from any given geographic neighbourhood at any given time is not currently possible with a single technique. One promising technique, originally developed for estimating populations at risk for disaster response and the like, that has been recently applied to criminological research (Andresen and Jenion, 2008a, 2008b; Andresen 2007; Andresen 2006), is the ambient population measure developed by Oakridge National Laboratories. This database estimates ambient population, which is an average estimate for a population’s likely location for a 24-hour period on the typical day, week, and season (Dobson, Bright,

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13 Ratcliffe (2002) and Jenion (2003) explain that aoristic analysis is one way to estimate the number of crimes occurring during a given time frame and was considered, but was determined to be beyond the scope of this analysis.
Coleman, Durfee, & Worley, 2000). Unfortunately, this technique has not reached the level of detail required for the current analysis. A preliminary application of this technique revealed its limitations, the largest being that the measure showed no ambient population in False Creek North, the area wherein GM Place is located, a finding we know to be incorrect.

In order to assess the population at risk for this analysis, a relatively accurate count is needed to estimate the potential criminal, non-criminal, and target populations. Obtaining such a count is increasingly difficult in a space such as Vancouver's downtown because the multitude of activities draw different people on different days and is further complicated by occurrence of Canucks games. Obtaining an accurate count of the population at risk was beyond the scope of this thesis, and therefore, only a hypothetical discussion surrounding how the populations at risk may change dependent on game day type is engaged in below. It is likely that the population of the different downtown neighbourhoods will change on different game day types based on residential population and different land uses, including liquor primary establishments and venue attendance because they have at least some form of generator effect.

It is believed that home games will draw the most people into the downtown to the venue itself and to nearby bars that show the game on television, which will increase the core's population significantly above the approximate 90 000 residents (City of Vancouver, 2007, Online). This could increase the population by at least that of the capacity of GM Place (approximately 20 000). It is also believed that on away and non-game days, the population will be less because the lack of a home game at GM Place reduces the generator effect. However, it is still expected that on away game days, bars will televise Canucks games, drawing individuals into the core to watch the game at the bars, but this generator effect will be lower than that on home game days. Finally, non-
game days should have the smallest change in populations at risk because there is no Canucks activity occurring on those days.

Given that it is expected that people will frequent bars to watch Canucks games on television, it is logical to assume the number of liquor primary establishments in a given neighbourhood will affect the population at risk. Liquor licensing records for Vancouver help locate the number of establishments in the downtown. The Liquor Control and Licensing Board (LCLB) through the Ministry of Public Safety and Solicitor General (PSSG) of British Columbia made this information available to ICURS for research purposes. These data include such fields as address, seating, and the primary function. Of particular interest for this study are those establishments where the primary function is liquor service because during hockey games these types of establishments tend to televise the game and attract patrons to view the game. Moreover, because studies have shown that alcohol is related to violence (Cherpitel, 1993) and a range of other crime types (Roncdek & Maier, 1991; Graham & Wells, 2003), it is possible there will be a generator effect at these facilities.

The LCLB data contains information for Metro Vancouver. It identifies establishments as Food Primary, Licensee Retail Store, Liquor Primary, Manufacturer, and UBrew_UVin. The category of interest is Liquor Primary, so the data were filtered for liquor primary then geocoded in ArcGIS. It is thought that the Liquor Primary are those places which are more likely to have the hockey game playing and as such will draw individuals to them to watch the game, or after the game for further entertainment purposes, whereas those other establishments are less likely to show the game. Once geocoded, the addresses for the downtown study area were then selected. The geocode rate for the downtown is 100% meaning all Liquor Primary addresses were matched on the ArcGIS road network. Figure 3:3 is the result of the geocoding process.
and Table 3:1 – Count of Liquor Primary displays the number of liquor primaries by neighbourhood.

Figure 3:3 – Liquor Primary Establishment Locations
Table 3:1 – Count of Liquor Primary Establishments

<table>
<thead>
<tr>
<th>Neighbourhood</th>
<th>Liquor Primary</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBD</td>
<td>44</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td>5</td>
</tr>
<tr>
<td>Downtown South</td>
<td>44</td>
</tr>
<tr>
<td>False Creek North</td>
<td>7</td>
</tr>
<tr>
<td>West End</td>
<td>28</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>

The population at risk in the downtown is expected to be highest on home game days because bars and GM Place are assumed to be at capacity in addition to the residential population. The CBD, Downtown South, and False Creek North should see the highest influx of people because the former are bar districts and the latter is the neighbourhood where GM Place is located. The downtown should have a lesser influx in the evening hours on away game days, and even less so on non-game days given the lack of Canucks activity. However, The CBD and Downtown South will still draw people to watch the game when the Canucks play on the road, but less than on home game days. Finally, non-game days should see the smallest change in population due to the complete lack of Canucks games.

The above discussion is hypothetical and is to illustrate how, theoretically, the population of the downtown core may change between game day types. A numerical estimation of the population at risk was not included because there are too many assumptions being made for any degree of certainty in the change. For example, the capacity of liquor establishments could have been used to measure the population at risk (Engstad, 1975) but without engaging in qualitative research, there is no way to know to what degree capacity is met, and on what basis because capacity may not be
reached or establishments may exceed capacity on any given day (Eck and Weisburd, 1995).

Further limitations preventing a numerical estimate include the assumption that the 20,000 people attending home games or going to bars to watch the game (on home or away game days) are not residents. It is also assumed that those attending the game are not those frequenting the bars after the game ends. A further limitation lies within the sole use of liquor primary to estimate the population at risk because there may be food primary establishments also televising the hockey game. The sole use of liquor primary establishments is problematic because on any given day, people frequent restaurants in Vancouver's downtown, thereby changing the downtown's population. Perhaps the largest limitation to this analysis is that currently, there is no way to know when the other large venues in the downtown, such as BC Place or the Trade and Convention Centre are holding events which can drastically change the population at risk on any day type.

3.2 Variables

This analysis is exploratory in nature, and therefore, we are looking to see if the presence of a Canucks game, at home or away, has an effect on crime patterns. The latter is explored by examining the CFS per game day type for the four aforementioned COI, assault, theft from auto, vehicle theft, disorder and other (those not included in the COI). It is thought that we will see an increase in crimes on home game days because this will result in an increased number of targets amassing in the downtown core, giving rise to more criminal opportunities. Not only are we interested in the COI per game day type, this analysis also examines the different game day types, but during a game time period, from 17:00h to 04:00h, and at the hourly level.

Game time is included because it is assumed that when people's routine activities change as a result of a Canucks game, they will change during this time period.
Canucks games typically start around 19:00h and it is assumed that by around 17:00h people will be heading into the downtown to go to the game or perhaps for dinner beforehand. Games typically end around 22:00h and afterwards people may go to restaurants or perhaps a bar or club. By ending the time frame at 04:00h it gives an opportunity for crimes caused as a result of people leaving bars or restaurants to be captured. One further temporal analysis is included, an hourly analysis, to see if there is a variation in certain crimes at certain times of day because it is thought that, for example, there may be increases in CFS for vehicle crimes after the game finishes as people return to their car.

The final area of interest is how the game day type may affect the spatial distribution of crime. It is thought that certain areas of the downtown core, due to their characteristics, will have higher levels of certain types of crime. For example, False Creek North, the neighbourhood where GM Place is located, will have higher levels of vehicle crimes because there are car parks which change the opportunity structures for vehicle crimes, particularly on home game days, while neighbourhoods with high concentrations of bars will have higher levels of assault on home game days.

### 3.3 Methods

Given that this analysis is exploratory in nature, the analytic methods are rudimentary, no statistical analyses are conducted other than basic descriptive statistics which are used sparsely throughout the analysis. The main focus of this analysis is the temporal effects represented by averages of crimes per day and crimes per game time. The second component of the analysis is the spatial aspect represented by location quotients (LQs) to determine if certain neighbourhoods have a disproportionate amount of crime on particular day types. The final component of the analysis is a modification of
a new temporal technique based on the LQ, a location time quotient (LTQ) (Robinson, 2008).

3.3.1 Spatio-Temporal Analysis

Within this analysis, raw counts are rarely used because the differences between season types result in such large differences and the number of days between seasons vary such that a direct comparison cannot be made with their use, and therefore, a form of standardization is needed. Thus, the first component depicts average crimes per day by year across the seasons, game days and by location. The subsequent analysis does not maintain the yearly breakdown, but rather, all hockey seasons as a whole are compared to the lockout season. First, an overall baseline is set with the hockey seasons and compared to the lockout season. Crimes per day are also calculated for game day type and number of each COI is divided by the number of days for each type of day respectively: home-games, away-games, and non-games. These two different methods of crimes per day are also calculated per geographic unit, which is the first piece of the spatio-temporal analysis. This allows for a comparison of the hockey seasons per day crime averages by neighbourhood to the lockout season, followed by a comparison of crimes per game day type across the downtown core.

The same process set out above is used for the game time variable. Again the hockey seasons and the lockout season can be compared for overall crimes per day and again across neighbourhood boundaries between the different season types. This is followed by a comparison of game time crimes by game day types and then again across neighbourhood boundaries to see if the spatial distribution of crime is affected by the game time and game day type.

Note: the lockout season is only used for comparison in those instances where the game day type is not in question.
The majority of this analysis uses LQs and LTQs because they allow for a comparison of the proportion of crimes in a particular area and time, relative to the greater catchment area, assuming crime is evenly distributed. As such, most of the spatio-temporal analysis moves away from crime counts and averages and the LQ and the LTQ are applied.

### 3.3.2 Location Quotients

The location quotient is a technique that has been used in economic geography and regional economics since the 1940s (Miller, Gibson, & Wright, 1991). This technique was developed to measure "how well represented a particular industry is in a given study region" (Miller et al., 1991, p. 65). In this context, the location quotient indicates whether a particular area is over or under represented in a certain industry (Miller et al., 1991).

Although the location quotient has been used for nearly 70 years, Brantingham and Brantingham first used it in criminology in 1993 and since, it has not been widely used within the discipline (Andresen, 2007). Generally, LQs measure "the percentage of some activity in a spatial unit relative to the percentage of that same activity in the entire study region" (Andresen, 2007, p. 2424). In the criminological context, the crime location quotient (LQ) can measure if a particular area, province, city, or neighbourhood has a "relative speciality" in a certain crime as compared to the larger geographic area of interest (Brantingham & Brantingham, 1993c).

The LQ allows criminologists to examine the occurrence of a particular crime in a particular area of the city as it relates to the overall occurrence of said crime in the entire city. It may appear that a certain type of crime, break and enter (B&E) for example is low in a particular area of Vancouver. Shaughnessy for example, may have a low crime rate.

---

15 It should be noted that Barr and Pease (1990) discussed its use in relation to crime prevention but did not use it in their study.
overall but the crimes that occur most often in that area might be B&Es. This is not to say that there is a high crime occurrence in that area, but rather the most frequently occurring crime in that area are B&Es and therefore, people in that area are more likely to be victims of B&Es over any other crime (Andresen, 2007).

The LO is more than a theoretical concept; it has been applied in a practical context, however its use is sparse. LQs have been used to examine the proximity of vehicle thefts to shopping malls and commercial strips (Brantingham & Brantingham, 1993c, 1995b). Rengert (1996) used LQs to determine if arrestees in particular cities have different levels of drug use compared to the national average for that drug.

Through the use of violent crimes as an example, LQs have been shown to give a relative and contextual point of view when used in addition to crime rates and crime counts (Brantingham & Brantingham, 1998). LQs have also been shown to be a useful tool when compared with crime rates and crime counts through violent crimes. As an illustration, Andresen (2007) performed an inferential analysis using LQs as a dependent variable while applying the crime attractor concept to the findings. McCord and Ratcliffe (2007) also applied the LQ to drug markets in Philadelphia, finding that drug arrests tend to cluster around crime generators/attractors. Ratcliffe and Rengert (2008) used LQs to measure the number of an area’s initiator events relative to total shootings across Philadelphia. Finally, Robinson (2008) examined how “The Big Dig” in Boston’s North End affected crime specialization in the neighbourhood through using buffered location quotients. This author also included the use of a time location quotient, which examined how the location quotients changed over several years (this will be discussed in more detail below).

The LQ provides a useful tool to examine the subjective and contextual nature of the geographic dispersion and relative specialty of crime in the downtown. It is expected that certain areas will have certain crime specialization due to land use and opportunities
created there-from, for example, more vehicle related crimes are expected in the neighbourhoods surrounding BC Place and GM Place. This technique will be particularly useful to help identify whether certain neighbourhoods act as crime attractors or generators and from that a contextual analysis of the area may help determine why such is the case. The LQ is calculated as follows:

**Equation 3:1 – Location Quotient**

\[
LQ = \frac{\sum_{n=1}^{N} C_{in}}{\sum_{n=1}^{N} C_{tn}}
\]

Where:

- \( n \) = small study area
- \( N \) = total number in area
- \( C_i \) = count of crime of interest
- \( C_t \) = count of all crimes

Based on Brantingham and Brantingham (1993c, 1995b, 1998)

The traditional approach to the LQ is only used for one component of this analysis, to see if any particular neighbourhood has a disproportionate share of crime in the downtown core. The rest of the applications of the LQ include a temporal component and are discussed below.

### 3.3.3 Location Time Quotients

As mentioned above, LQs are not widely used in criminology and as such, the technique has only been extrapolated once to include a temporal component, the location time quotient (LTQ) (Robinson, 2008). Robinson (2008) examined four years worth of data (2002-2005). In doing so, she created a baseline with the LQ for the 2002 year and then compared the 2003-2005 years to the baseline, naming these the LTQs.
This allowed a comparison of how the LQs changed in the North End of Boston around the Big Dig site throughout her study period. This study is a good example of how a temporal component may be added to the LQ and will be similarly used herein and expanded upon.

The first application of the LTQ is similar to Robinson (2008), as the LTQs will be examined between hockey seasons compared to the lockout season across the downtown neighbourhoods. For this analysis however, this comparison will still be referred to as the LQ, because it is comparing a grouping of types of years to another type, rather than being concerned with the change over time. From that, this analysis proceeds with the LTQ on a smaller spatio-temporal level moving to explore the utility of the LTQ at the day level (game day type), time period (game time), and the hourly level, a variant of the LQ that has been previously discussed but not applied (Brantingham & Brantingham, 1998). This technique allows for the spatial and temporal facets of crime to be examined together.

The LQ is a versatile measure because its numerator and denominator are based on raw counts and as such, are easily modified for different analytic purposes such as a specific crime, space, or temporal period of interest (Brantingham & Brantingham, 1993c, 1995b, 1998). Ratcliffe and Rengert (2008) explain, “Location quotients are values that indicate the relative distribution of a feature compared to the expected distribution if that feature were distributed evenly across the whole region” (p. 71). In this case, the LTQ will measure the relative distribution over a time period of a feature compared to the expected distribution if the feature were distributed evenly over the specified time period.

LQs measure the relative proportionality of crime in a region compared to the greater region. Certain areas may have disproportionate levels of crime, and as the literature above showed, certain geographic areas are more likely to have crime for a
variety of reasons. Ratcliffe (2004) notes, that while there are numerous spatial patterns
to crime, such temporal patterns also exist. While certain geographic areas may result in
a concentration of crime, certain time periods may also result in crime concentrations –
the next logical step is to assume that certain regions may be more prone to crime at
certain times of the day (Ratcliffe, 2004). As such, the purpose of this LTQ is to examine
whether certain neighbourhoods in Vancouver’s downtown are prone to crime at
particular times of the day. The LTQ formula is derived from the LQ formula and is
calculated as follows:

\[
LTQ_j = \frac{\sum_{i=1}^{N} C_{ijt}}{\sum_{j=1}^{N} \sum_{i=1}^{N} C_{ijt}}
\]

Where:

\[i = \text{crime of interest}\]
\[j = \text{area of interest}\]
\[t = \text{time of interest}\]
\[C_{ijt} = \text{count of crime } i \text{ in area } j \text{ at time } t\]

Although the above is primarily concerned with the temporal factor associated
with the distribution of crime over time rather than space, it will inherently have a
georgraphic component to it and therefore is not merely a time quotient, but rather a
location time quotient. Part in parcel to this analysis will be how these time quotients
vary by neighbourhood because it is very possible that different areas of the city will
have disproportionate amounts of crimes at certain times of the day. For example, the
bar district (Downtown South and the CBD) may have more assaults when bars let out,
while False Creek North may specialize in vehicle crimes after the Canucks games end
as people return to their vehicles to discover they are damaged or missing. This method has all the advantages associated with the LQ; it does not require an estimation of the population at risk which can be a problem when using crime rates (Boggs, 1965; Harries, 1991), it adds a visual and contextual component to the analysis, and gives an alternative measure to percentages (Brantingham & Brantingham, 1993c, 1998). This technique is particularly useful to this analysis because it compliments the attractor/generator concept as the LQs may be an indicator of what areas have crime attractors or generators (Brantingham & Brantingham, 1998). Adding a temporal component allows additional layers of analyses, including where and when people are attracted. Further, once areas and times are identified, a qualitative examination of these areas and the context within which these crimes take place may be instructive as to what is acting as a crime attractor or generator.
CHAPTER 4: RESULTS

The following section provides the results for the analysis described above and includes a description of what appears to be the effects of the Canucks games on crime patterns in downtown Vancouver.

The counts of different day types, home, away, non-game, and season days are presented in Appendix B for each season and show little variation between them. The number of games per season depends on how successful the Canucks were in the playoffs. There are 82 games played per regular season and during the playoffs, the Canucks tend to end their season in the first or second round, which results in an additional four to fourteen games. Appendix Table 2 – Crime Counts per Season in Appendix B presents the raw counts of the COI per season. These are all of the incidents reported to the VPD for each season. This table shows the fluctuations in reported incidents per season and is not divided by game day type. From the latter two tables, it is possible to calculate the crimes per day, which is of particular interest and is displayed in Table 4:1 below.

The grand total in Table 4:1 is the baseline for crimes per day, which is calculated using all the days and crimes for each season, hockey and lockout. The lockout season is not far from the baseline whereas some of the other seasons have crimes per day far above and below.
### Table 4:1 – Crimes per Day

<table>
<thead>
<tr>
<th>Season</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000/2001 Season</td>
<td>7.06</td>
<td>19.52</td>
<td>18.92</td>
<td>3.67</td>
<td>108.37</td>
<td>157.54</td>
</tr>
<tr>
<td>2001/2002 Season</td>
<td>6.79</td>
<td>19.74</td>
<td>23.33</td>
<td>3.78</td>
<td>119.00</td>
<td>172.64</td>
</tr>
<tr>
<td>2002/2003 Season</td>
<td>7.06</td>
<td>21.25</td>
<td>13.31</td>
<td>5.05</td>
<td>101.80</td>
<td>148.47</td>
</tr>
<tr>
<td>2003/2004 Season</td>
<td>9.74</td>
<td>26.41</td>
<td>14.88</td>
<td>6.07</td>
<td>118.72</td>
<td>175.81</td>
</tr>
<tr>
<td><strong>2004/2005 Lockout</strong></td>
<td><strong>7.81</strong></td>
<td><strong>24.75</strong></td>
<td><strong>11.51</strong></td>
<td>4.32</td>
<td><strong>104.59</strong></td>
<td><strong>152.96</strong></td>
</tr>
<tr>
<td>2005/2006 Season</td>
<td>8.57</td>
<td>36.36</td>
<td>11.96</td>
<td>2.15</td>
<td>123.49</td>
<td>182.53</td>
</tr>
<tr>
<td>2006/2007 Season</td>
<td>7.26</td>
<td>25.29</td>
<td>6.33</td>
<td>1.08</td>
<td>143.05</td>
<td>183.00</td>
</tr>
<tr>
<td><strong>Grand Total (Downtown)</strong></td>
<td><strong>7.73</strong></td>
<td><strong>24.59</strong></td>
<td><strong>14.30</strong></td>
<td><strong>3.73</strong></td>
<td><strong>117.03</strong></td>
<td><strong>167.38</strong></td>
</tr>
</tbody>
</table>

The descriptive statistics in Table 4:2, and specifically the standard deviation, indicates that there is considerable variation throughout the years across crime categories.

### Table 4:2 – Descriptive Statistics

<table>
<thead>
<tr>
<th>Crime</th>
<th>N (# of years)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assault</td>
<td>7</td>
<td>6.79</td>
<td>9.74</td>
<td>7.76</td>
<td>1.06</td>
</tr>
<tr>
<td>Disorder</td>
<td>7</td>
<td>19.52</td>
<td>36.36</td>
<td>24.76</td>
<td>5.81</td>
</tr>
<tr>
<td>TFA</td>
<td>7</td>
<td>6.33</td>
<td>23.33</td>
<td>14.32</td>
<td>5.49</td>
</tr>
<tr>
<td>VT</td>
<td>7</td>
<td>1.08</td>
<td>6.07</td>
<td>3.73</td>
<td>1.68</td>
</tr>
</tbody>
</table>
Fluctuations in crimes per day for the study period are shown in Figure 4:1. The
lockout season, the point of comparison, is not dissimilar from the rest of the study
period. The lockout season effectively acts as a control for this exploration, thereby
allowing for a point of comparison wherein no Canucks games were played. As such, the
remainder of the results will compare the hockey seasons to the lockout seasons where
applicable.

Standardization is required for comparative purposes between season types
because the hockey seasons category is six years of CFS while the lockout season is
one year of data, and therefore, crimes per day are presented in Table 4:3 (see
Appendix Table 3 – Crime Counts of Hockey Season vs. Lockout Season in Appendix B
for raw counts).

<table>
<thead>
<tr>
<th>Season</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hockey Seasons</td>
<td>7.71</td>
<td>24.57</td>
<td>14.77</td>
<td>3.63</td>
<td>119.10</td>
<td>169.78</td>
</tr>
<tr>
<td>Lockout Season</td>
<td>7.84</td>
<td>24.87</td>
<td>11.56</td>
<td>4.34</td>
<td>105.11</td>
<td>153.73</td>
</tr>
<tr>
<td>Total Study Period</td>
<td>7.73</td>
<td>24.61</td>
<td>14.31</td>
<td>3.73</td>
<td>117.11</td>
<td>167.50</td>
</tr>
</tbody>
</table>
The data in Table 4:3 are represented in Figure 4:2 and show that generally little variation exists between the season types. Depending on the crime in question, either season may be higher or lower than the baseline.

**Figure 4:2 – Crimes of Interest by Season Type**

Within the hockey seasons, three different day types exist: home, away, and non-game days. Given that the number of days differ between each day type, particularly on non-game days, raw counts are not presented (see Appendix Table 4 – Crime Counts per Game Day Type in Appendix B), rather, Table 4:4 indicates the average crimes per day by game day type as a method of standardization across the game day types for all six hockey seasons.

**Table 4:4 – Crimes per Day by Type of Day**

<table>
<thead>
<tr>
<th>Game Day</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>7.93</td>
<td>24.52</td>
<td>15.10</td>
<td>3.69</td>
<td>120.64</td>
<td>51.24</td>
</tr>
<tr>
<td>Away</td>
<td>7.55</td>
<td>24.08</td>
<td>14.36</td>
<td>3.53</td>
<td>119.33</td>
<td>49.52</td>
</tr>
<tr>
<td>Non-Game</td>
<td>7.69</td>
<td>24.78</td>
<td>14.80</td>
<td>3.65</td>
<td>118.41</td>
<td>50.91</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>7.72</td>
<td>24.46</td>
<td>14.75</td>
<td>3.62</td>
<td>119.46</td>
<td>50.56</td>
</tr>
<tr>
<td><strong>Std. Dev.</strong></td>
<td>0.19</td>
<td>0.35</td>
<td>0.37</td>
<td>0.08</td>
<td>1.12</td>
<td>0.91</td>
</tr>
</tbody>
</table>
The "Average" row sets the baseline for the hockey seasons and the standard deviation shows little variation within the game day type. However, a pattern emerges, nonetheless; there are more crimes on home game days, followed by non-game days, then away-game days, except for disorder when the pattern is non-game, followed by home, and away game days. Further, home game days show higher levels of crimes per day than the average for the season, except for disorder where non-game days are highest. Although the pattern found above is small, a difference nonetheless exists. This difference warrants further examination to determine if the same pattern is present across the downtown core, or, if in certain neighbourhoods, the pattern is exacerbated.

4.1 Neighbourhood Analysis

Place and space affect crime opportunities, particularly when they act as crime attractors or generators. The presence of an attractor or generator can be affected by land uses in a given area and Vancouver's downtown neighbourhoods have different characteristics (see Appendix C). Therefore, it is likely that certain crimes will cluster in certain neighbourhoods and this proposition is examine below.
Figure 4:3 – Hockey Seasons Total Crimes of Interest by Neighbourhood

Figure 4:4 – Lockout Season Total Crimes of Interest by Neighbourhood
Figures 4:3 and 4:4 depict the geographic dispersion of the total COI by
eighbourhood for both season types. These maps illustrate that the spatial distribution
of crime is similar regardless of the presence of the Canucks games, with the most
crimes occurring in the CBD, followed by the West End, Downtown South, False Creek
North, and Central Waterfront. The maps were created using raw crime counts, so a
direct numerical comparison is meaningless, but such a presentation nonetheless
depicts similar spatial distributions of total COI. As such, the numbers were standardized
from Appendix Table 5 – Average Crimes per Day by Season in Appendix B and
differences in average crimes per day by season are presented in Table 4:5 – Difference
in Average Crimes per Day by Neighbourhood by Season Type.

<table>
<thead>
<tr>
<th>Neighbourhood</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBD</td>
<td>-0.58</td>
<td>-2.05</td>
<td>2.05</td>
<td>-0.41</td>
<td>0.98</td>
<td>0.01</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td>0.25</td>
<td>0.32</td>
<td>0.18</td>
<td>0</td>
<td>1.4</td>
<td>2.15</td>
</tr>
<tr>
<td>Downtown South</td>
<td>0.07</td>
<td>1.62</td>
<td>0.19</td>
<td>-0.13</td>
<td>4.53</td>
<td>6.28</td>
</tr>
<tr>
<td>False Creek North</td>
<td>0.2</td>
<td>0.95</td>
<td>0.69</td>
<td>0.06</td>
<td>4.65</td>
<td>6.55</td>
</tr>
<tr>
<td>West End</td>
<td>-0.06</td>
<td>-1.17</td>
<td>0.1</td>
<td>-0.23</td>
<td>2.43</td>
<td>1.07</td>
</tr>
</tbody>
</table>

Table 4:5 presents the sum difference between the two season types and was
calculated by subtracting the average crime per day for the lockout season from the
average crime per day for hockey seasons. Positive values indicate more crimes per day
for the hockey seasons and negative values indicate more crimes per day for the lockout
season. The biggest differences are that there are 2.05 more disorder crimes per day
during the lockout season in the CBD and 1.17 in the West End, while the hockey
seasons have 2.05 more theft from auto crimes in the CBD and 1.62 more disorder
crimes in the Downtown South neighbourhood. One point of note is that only False
Creek North continually has more crimes per day during the hockey seasons compared
to the lockout season.
Table 4:6 displays the average crimes per game day type across the downtown core. Few general patterns emerge as this table shows the “Game Day Type” that has the highest crimes per day is dependent on crime and neighbourhood. However, specific patterns become manifest. Although the differences are marginal, False Creek North consistently has the more crimes per day on home, rather than away and non-game days. Another pattern emerging in the differences in the crimes per day indicate that away and Non-game days may be more similar to one another than they are to home game days.

What is perhaps the most important pattern derived from this table is that while there is considerable variation between the neighbourhoods in regards to crimes per game day type, (disorder being the best example with a range from 0.78-9.20 for home
game days), within each neighbourhood there is little variation between the game day types with the biggest range being a 0.52 difference in theft from auto in the CBD.

4.2 Location Quotients and Location Time Quotients

The above analysis presented how many crimes per day are seen between the season types and across downtown core, but did not include a measure comparing the distribution of crime relative to the other areas of the downtown. The LQ allows for such a comparison as it presents the spatial distribution of crime for a particular neighbourhood as it relates to rest of the larger catchment area assuming and equal distribution of crime, indicating if a particular neighbourhood shares a disproportionate amount of crime. The result is that the remainder of the analysis moves away from the average crimes per day, to the LQ and LTQ because they include a spatio-temporal component allowing for a relative comparison of one neighbourhood and/or temporal period to the greater area and time period of interest.

The LQ is a ratio with a base of one. If the LQ is equal to one, then it has a perfectly proportionate amount of crime relative to the downtown core; if the neighbourhood has a LQ less than one, it has disproportionately less crime than the downtown core, and if the LQ is greater than one, it has disproportionately more crime than the rest of the core. In other words, if a particular area has an LQ of 1.3, it has 30% more crime than the downtown core as a whole and therefore specializes in that crime (Andresen, Forthcoming). Miller et al. (1991) provides five categorizations for how represented a location is for a particular crime. For the purposes of this analysis however, only three categorizations are used, but are derived from their work. A LQ <0.90 is underrepresented, 0.91-1.10 is proportionately represented, and > 1.11 indicates a neighbourhood is overrepresented for a particular crime.
Table 4:7 – LQs by Season

<table>
<thead>
<tr>
<th>Neighbourhood (Lockout Season)</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Business District</td>
<td>1.09</td>
<td>1.00</td>
<td>0.94</td>
<td>0.78</td>
<td>1.01</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td>1.37</td>
<td>0.79</td>
<td>1.11</td>
<td>0.45</td>
<td>1.11</td>
</tr>
<tr>
<td>Downtown South</td>
<td>1.29</td>
<td>0.73</td>
<td>1.06</td>
<td>1.00</td>
<td>1.06</td>
</tr>
<tr>
<td>False Creek North</td>
<td>1.02</td>
<td>0.58</td>
<td>1.04</td>
<td>1.14</td>
<td>1.04</td>
</tr>
<tr>
<td>West End</td>
<td>0.67</td>
<td>1.33</td>
<td>0.93</td>
<td>1.25</td>
<td>0.93</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neighbourhood (Hockey Seasons)</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Business District</td>
<td>1.00</td>
<td>0.87</td>
<td>1.23</td>
<td>0.69</td>
<td>1.01</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td>1.90</td>
<td>0.94</td>
<td>1.02</td>
<td>0.37</td>
<td>1.02</td>
</tr>
<tr>
<td>Downtown South</td>
<td>1.24</td>
<td>0.99</td>
<td>1.03</td>
<td>0.91</td>
<td>1.03</td>
</tr>
<tr>
<td>False Creek North</td>
<td>1.01</td>
<td>0.75</td>
<td>1.02</td>
<td>1.21</td>
<td>1.02</td>
</tr>
<tr>
<td>West End</td>
<td>0.71</td>
<td>1.29</td>
<td>0.96</td>
<td>1.40</td>
<td>0.96</td>
</tr>
</tbody>
</table>

The value of the LQ becomes manifest when we compare these results to the raw counts and crimes per day (See Appendix Table 3 – Crime Counts of Hockey Season vs. Lockout Season and Appendix Table 5 – Average Crimes per Day by Season in Appendix B). To illustrate the usefulness of the LQ, we can examine Central Waterfront. Although the raw count and the average assaults per day are low, the LQ indicates the neighbourhood has a disproportionately high level of assault compared to the rest of the downtown. This pattern is consistent for both the lockout and the hockey seasons, although the LQ increases by nearly 60 per cent from the lockout season to the hockey seasons.

Most of the LQs for this study fall within the 0.91-1.10 range, with only a few of the neighbourhoods being over represented for a particular crime such as vehicle theft in the West End during the hockey season or assaults in Central Waterfront for the same season. The inverse is also true with very few being underrepresented for these crimes, such as disorder in False Creek North or vehicle theft in Central Waterfront during the lockout season. It should also be noted that the other category shows consistent proportionality across the neighbourhoods and season types.

In examining the Table 4:7 – LQs by Season, no consistent general pattern emerges in comparing the season types as LQs fluctuate across location, crime type,
and season type. The above use of the LO is instructive insofar as it illustrates which areas of the downtown core share disproportionately more or less amounts of crime for the periods in question. It does not, however, give an indication of the geographic distribution of crime as it may be affected by the presence of a Canucks home or away game. For the latter, the LTQ is required.

Table 4:8 – LTQ by Game Day Type

<table>
<thead>
<tr>
<th></th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CBD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>0.97</td>
<td>0.84</td>
<td>1.27</td>
<td>0.59</td>
<td>1.01</td>
</tr>
<tr>
<td>Away</td>
<td>1.02</td>
<td>0.89</td>
<td>1.19</td>
<td>0.74</td>
<td>1.01</td>
</tr>
<tr>
<td>Non-Game</td>
<td>1.01</td>
<td>0.87</td>
<td>1.23</td>
<td>0.72</td>
<td>1.01</td>
</tr>
<tr>
<td><strong>Central Waterfront</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>1.82</td>
<td>0.91</td>
<td>0.49</td>
<td>0.29</td>
<td>1.05</td>
</tr>
<tr>
<td>Away</td>
<td>2.03</td>
<td>0.78</td>
<td>0.62</td>
<td>0.43</td>
<td>1.04</td>
</tr>
<tr>
<td>Non-Game</td>
<td>1.89</td>
<td>1.01</td>
<td>0.61</td>
<td>0.37</td>
<td>1.01</td>
</tr>
<tr>
<td><strong>Downtown South</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>1.24</td>
<td>1.02</td>
<td>0.71</td>
<td>0.93</td>
<td>1.02</td>
</tr>
<tr>
<td>Away</td>
<td>1.26</td>
<td>0.97</td>
<td>0.65</td>
<td>0.99</td>
<td>1.03</td>
</tr>
<tr>
<td>Non-Game</td>
<td>1.24</td>
<td>0.98</td>
<td>0.68</td>
<td>0.87</td>
<td>1.03</td>
</tr>
<tr>
<td><strong>False Creek North</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>1.12</td>
<td>0.74</td>
<td>1.19</td>
<td>1.31</td>
<td>1.01</td>
</tr>
<tr>
<td>Away</td>
<td>0.98</td>
<td>0.77</td>
<td>1.27</td>
<td>1.12</td>
<td>1.01</td>
</tr>
<tr>
<td>Non-Game</td>
<td>0.97</td>
<td>0.75</td>
<td>1.23</td>
<td>1.20</td>
<td>1.02</td>
</tr>
<tr>
<td><strong>West End</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>0.70</td>
<td>1.32</td>
<td>0.87</td>
<td>1.46</td>
<td>0.96</td>
</tr>
<tr>
<td>Away</td>
<td>0.68</td>
<td>1.28</td>
<td>0.95</td>
<td>1.33</td>
<td>0.96</td>
</tr>
<tr>
<td>Non-Game</td>
<td>0.72</td>
<td>1.28</td>
<td>0.91</td>
<td>1.40</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Table 4:8 – LTQ by Game Day Type show that there is considerable variation between the game day types. The time frame here is for the 24-hour period, from 00:00:00h to 23:59:59h on the game days in question. Within each neighbourhood there is typically little variation between the game day types, typically no more than a 20 per cent variation. However, between the neighbourhoods there is a considerable range by game day type.

The West End is consistently overrepresented for disorder, False Creek North for vehicle crimes, and Central Water Front for assaults across all game day types. The
same pattern exists on the other end of the LTQ spectrum; for example, Central Waterfront has disproportionately low LTQs of vehicle crimes regardless of the game day type. In examining Table 4:8 – LTQ by Game Day Type shows that when a given neighbourhood is highly overrepresented for a particular crime, for example assaults in Central Waterfront for example, then the area is underrepresented for at least one other crime type as is seen for theft from auto and vehicle theft. The same is true for False Creek North. That neighbourhood is overrepresented for theft from auto, vehicle theft, and slightly overrepresented for assaults, but is underrepresented for disorder. This is because if a neighbourhood has an extremely high overrepresentation of one crime type, the neighbourhood cannot have an overrepresentation for all crimes in that area. The above presented the first use of the LTQ and it can be further used for hourly level analyses.

4.3 Micro-Temporal Analysis

Just as crimes are distributed over space, they are also distributed over time of day. The hourly use of the LTQ indicates whether certain hours of the day are overrepresented for a particular type of crime while also giving us an indication whether there are more reported incidents during that period and in a certain neighbourhood. While the LTQ does not indicate the percentage of incidents reported during that time frame, a higher or lower LTQ allows us to discern if that hour-band or time period has more or less reported incidents relative to other hours or time periods.

Table 4:9 – LTQ by Hour presents the LTQ per hour for the hockey and lockout seasons for the crimes of interest. The purpose of this table is to illustrate how the LTQ may be presented at the micro, or hourly level. Furthermore, Table 4:9 – LTQ by Hour shows how the patterns between the season types vary. Assaults tend to be overrepresented during the early hours of the morning when drinking establishments
close and are underrepresented between 08:00h-16:00h; disorder during the lockout season is proportionate for most of the day with overrepresentation from 06:00h to 11:00h, while the hockey seasons have a disproportionate share between 05:00h and 08:00h. Both season types have disproportionate amounts of theft from auto from 08:00h to 15:00h, with this pattern continuing during the hockey seasons till 18:00h. Reports of vehicle theft are overrepresented between 08:00h and 13:00h. During the hockey seasons 00:00h to 03:00h vehicle theft is underrepresented and the lockout season is overrepresented at 00:00h and proportionate between 01:00h and 03:00h.

Table 4.9 - LTQ by Hour

<table>
<thead>
<tr>
<th>Hour</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00h</td>
<td>1.51</td>
<td>1.09</td>
<td>0.46</td>
<td>0.60</td>
<td>1.45</td>
<td>0.99</td>
<td>0.38</td>
<td>1.35</td>
</tr>
<tr>
<td>01:00</td>
<td>2.18</td>
<td>1.04</td>
<td>0.35</td>
<td>0.67</td>
<td>2.10</td>
<td>0.89</td>
<td>0.29</td>
<td>0.91</td>
</tr>
<tr>
<td>02:00</td>
<td>2.93</td>
<td>1.04</td>
<td>0.25</td>
<td>0.65</td>
<td>3.43</td>
<td>0.76</td>
<td>0.29</td>
<td>1.07</td>
</tr>
<tr>
<td>03:00</td>
<td>2.19</td>
<td>1.12</td>
<td>0.25</td>
<td>0.71</td>
<td>2.56</td>
<td>0.82</td>
<td>0.18</td>
<td>1.01</td>
</tr>
<tr>
<td>04:00</td>
<td>1.29</td>
<td>1.19</td>
<td>0.32</td>
<td>1.19</td>
<td>1.44</td>
<td>0.99</td>
<td>0.27</td>
<td>0.84</td>
</tr>
<tr>
<td>05:00</td>
<td>0.80</td>
<td>1.12</td>
<td>0.31</td>
<td>0.99</td>
<td>0.88</td>
<td>1.11</td>
<td>0.40</td>
<td>1.28</td>
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<tr>
<td>06:00</td>
<td>0.59</td>
<td>1.29</td>
<td>0.50</td>
<td>1.17</td>
<td>1.17</td>
<td>1.45</td>
<td>0.41</td>
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</tr>
<tr>
<td>07:00</td>
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<td>1.05</td>
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<td>1.15</td>
<td>1.73</td>
</tr>
<tr>
<td>08:00</td>
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<td>0.54</td>
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<td>1.59</td>
<td>1.41</td>
</tr>
<tr>
<td>09:00</td>
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<td>0.95</td>
<td>1.67</td>
<td>1.28</td>
<td>0.58</td>
<td>1.27</td>
<td>1.70</td>
<td>1.44</td>
</tr>
<tr>
<td>10:00</td>
<td>0.54</td>
<td>1.00</td>
<td>1.64</td>
<td>1.30</td>
<td>0.47</td>
<td>1.27</td>
<td>1.38</td>
<td>1.49</td>
</tr>
<tr>
<td>11:00</td>
<td>0.51</td>
<td>0.91</td>
<td>1.64</td>
<td>1.16</td>
<td>0.57</td>
<td>1.21</td>
<td>1.59</td>
<td>1.28</td>
</tr>
<tr>
<td>12:00</td>
<td>0.60</td>
<td>0.89</td>
<td>1.62</td>
<td>1.24</td>
<td>0.81</td>
<td>1.10</td>
<td>1.31</td>
<td>1.27</td>
</tr>
<tr>
<td>13:00</td>
<td>0.69</td>
<td>0.94</td>
<td>1.37</td>
<td>1.10</td>
<td>0.79</td>
<td>1.12</td>
<td>1.12</td>
<td>1.75</td>
</tr>
<tr>
<td>14:00</td>
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<td>0.90</td>
<td>1.32</td>
<td>1.08</td>
<td>0.82</td>
<td>1.20</td>
<td>0.99</td>
<td>1.09</td>
</tr>
<tr>
<td>15:00</td>
<td>0.64</td>
<td>0.89</td>
<td>1.25</td>
<td>0.97</td>
<td>0.74</td>
<td>1.21</td>
<td>0.94</td>
<td>1.34</td>
</tr>
<tr>
<td>16:00</td>
<td>0.69</td>
<td>0.91</td>
<td>1.22</td>
<td>0.96</td>
<td>0.76</td>
<td>1.08</td>
<td>0.93</td>
<td>1.58</td>
</tr>
<tr>
<td>17:00</td>
<td>0.75</td>
<td>0.90</td>
<td>1.18</td>
<td>1.15</td>
<td>0.86</td>
<td>1.05</td>
<td>1.10</td>
<td>1.39</td>
</tr>
<tr>
<td>18:00</td>
<td>0.78</td>
<td>0.88</td>
<td>1.11</td>
<td>1.19</td>
<td>0.85</td>
<td>1.09</td>
<td>0.82</td>
<td>1.64</td>
</tr>
<tr>
<td>19:00</td>
<td>0.72</td>
<td>0.96</td>
<td>0.99</td>
<td>0.86</td>
<td>0.97</td>
<td>1.12</td>
<td>0.76</td>
<td>1.11</td>
</tr>
<tr>
<td>20:00</td>
<td>0.92</td>
<td>0.97</td>
<td>0.77</td>
<td>0.78</td>
<td>0.95</td>
<td>1.02</td>
<td>0.73</td>
<td>1.62</td>
</tr>
<tr>
<td>21:00</td>
<td>1.00</td>
<td>0.94</td>
<td>0.72</td>
<td>0.93</td>
<td>0.76</td>
<td>0.95</td>
<td>0.76</td>
<td>1.26</td>
</tr>
<tr>
<td>22:00</td>
<td>1.00</td>
<td>1.06</td>
<td>0.78</td>
<td>0.99</td>
<td>1.46</td>
<td>1.26</td>
<td>0.64</td>
<td>1.69</td>
</tr>
<tr>
<td>23:00</td>
<td>1.13</td>
<td>1.09</td>
<td>0.60</td>
<td>0.85</td>
<td>1.19</td>
<td>1.11</td>
<td>0.49</td>
<td>0.78</td>
</tr>
</tbody>
</table>
Table 4:9 – LTQ by Hour is presented to illustrate the differences and fluctuations seen throughout the day at the hourly level across the crimes of interest and Season types. An in depth discussion of these variations is engaged in below.

While Table 4:9 – LTQ by Hour is useful to illustrate how the reported crimes of interest are temporally distributed, it does not provide the spatial distribution of crime by hour (doing so is out of the scope of this thesis). The subsequent analysis focuses on the game time, and as such, Table 4:10 – Per cent of Game Time Crimes per Neighbourhood provides the per cent of the crimes of interest reported during game time for the different seasons.

<table>
<thead>
<tr>
<th>Hockey Season</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBD</td>
<td>70.77%</td>
<td>46.88%</td>
<td>38.14%</td>
<td>48.76%</td>
<td>49.99%</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td>68.01%</td>
<td>64.36%</td>
<td>28.21%</td>
<td>61.11%</td>
<td>56.33%</td>
</tr>
<tr>
<td>Downtown South</td>
<td>71.32%</td>
<td>52.76%</td>
<td>28.44%</td>
<td>42.60%</td>
<td>54.84%</td>
</tr>
<tr>
<td>False Creek North</td>
<td>67.49%</td>
<td>56.23%</td>
<td>39.38%</td>
<td>52.11%</td>
<td>54.14%</td>
</tr>
<tr>
<td>West End</td>
<td>61.96%</td>
<td>50.01%</td>
<td>29.19%</td>
<td>35.76%</td>
<td>48.25%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lockout Season</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBD</td>
<td>71.97%</td>
<td>40.22%</td>
<td>42.28%</td>
<td>52.82%</td>
<td>50.28%</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td>70.00%</td>
<td>69.23%</td>
<td>9.52%</td>
<td>33.33%</td>
<td>60.37%</td>
</tr>
<tr>
<td>Downtown South</td>
<td>71.13%</td>
<td>54.90%</td>
<td>29.61%</td>
<td>46.99%</td>
<td>58.75%</td>
</tr>
<tr>
<td>False Creek North</td>
<td>65.29%</td>
<td>46.10%</td>
<td>37.32%</td>
<td>52.38%</td>
<td>56.10%</td>
</tr>
<tr>
<td>West End</td>
<td>54.46%</td>
<td>46.20%</td>
<td>27.58%</td>
<td>44.18%</td>
<td>48.48%</td>
</tr>
</tbody>
</table>

Like the above results, the amount of reported incidents during game time fluctuates by location and crime type. Generally, the pattern for both season types is during game time, the majority of assaults are reported; roughly half of disorder crimes, approximately 30 to 40 per cent of theft from auto, and vehicle theft vary a great deal based on neighbourhood, from 20 to 60 per cent. Within this, large variations are seen in Central Waterfront due to the low numbers of reported offences.

Table 4:11 – Game Time LTQ by Season Type shows the LTQs for the game time, 17:00-03:59h and the other time period, 0:400-15:59h for the hockey and lockout
Seasons. Again, the pattern is dependent on location and time-band. Certain locations have higher crimes during the other time category such as assaults in the CBD during the lockout season. Downtown South and Central Waterfront are overrepresented for assaults for both time categories and Season Types, but Central Waterfront presents much higher LTQs during the other time categories. Points of interest found below are the overrepresentation of theft from auto in False Creek North for each time category, vehicle theft during game time for both season types, and continuous underrepresentation of disorder. Disorder and vehicle theft are overrepresented for each

<table>
<thead>
<tr>
<th>Time Period/Neighbourhood</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CBD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hockey Season (17:00 - 03:59)</td>
<td>1.06</td>
<td>0.82</td>
<td>1.39</td>
<td>0.80</td>
<td>1.00</td>
</tr>
<tr>
<td>Hockey Season (04:00-16:59)</td>
<td>0.91</td>
<td>0.91</td>
<td>1.13</td>
<td>0.61</td>
<td>1.01</td>
</tr>
<tr>
<td>Lockout Season (17:00 - 03:59)</td>
<td>1.20</td>
<td>0.91</td>
<td>1.18</td>
<td>0.88</td>
<td>0.99</td>
</tr>
<tr>
<td>Lockout Season (04:00 - 16:59)</td>
<td>0.92</td>
<td>1.06</td>
<td>0.81</td>
<td>0.70</td>
<td>1.03</td>
</tr>
<tr>
<td><strong>Central Waterfront</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hockey Season (17:00 - 03:59)</td>
<td>1.67</td>
<td>1.05</td>
<td>0.42</td>
<td>0.46</td>
<td>0.99</td>
</tr>
<tr>
<td>Hockey Season (04:00-16:59)</td>
<td>2.23</td>
<td>0.79</td>
<td>0.74</td>
<td>0.29</td>
<td>1.06</td>
</tr>
<tr>
<td>Lockout Season (17:00 - 03:59)</td>
<td>1.17</td>
<td>0.99</td>
<td>0.09</td>
<td>0.26</td>
<td>1.08</td>
</tr>
<tr>
<td>Lockout Season (04:00 - 16:59)</td>
<td>1.63</td>
<td>0.57</td>
<td>0.67</td>
<td>0.70</td>
<td>1.15</td>
</tr>
<tr>
<td><strong>Downtown South</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hockey Season (17:00 - 03:59)</td>
<td>1.21</td>
<td>0.96</td>
<td>0.53</td>
<td>0.85</td>
<td>1.03</td>
</tr>
<tr>
<td>Hockey Season (04:00-16:59)</td>
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<td>1.01</td>
<td>0.80</td>
<td>0.98</td>
<td>1.02</td>
</tr>
<tr>
<td>Lockout Season (17:00 - 03:59)</td>
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<td>0.79</td>
<td>0.67</td>
<td>0.86</td>
<td>1.05</td>
</tr>
<tr>
<td>Lockout Season (04:00 - 16:59)</td>
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<td>0.69</td>
<td>1.06</td>
<td>1.17</td>
<td>1.05</td>
</tr>
<tr>
<td><strong>False Creek North</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hockey Season (17:00 - 03:59)</td>
<td>0.94</td>
<td>0.79</td>
<td>1.33</td>
<td>1.38</td>
<td>1.01</td>
</tr>
<tr>
<td>Hockey Season (04:00-16:59)</td>
<td>1.11</td>
<td>0.71</td>
<td>1.21</td>
<td>1.08</td>
<td>1.02</td>
</tr>
<tr>
<td>Lockout Season (17:00 - 03:59)</td>
<td>0.93</td>
<td>0.56</td>
<td>1.48</td>
<td>1.19</td>
<td>1.06</td>
</tr>
<tr>
<td>Lockout Season (04:00 - 16:59)</td>
<td>1.17</td>
<td>0.61</td>
<td>1.45</td>
<td>1.10</td>
<td>1.02</td>
</tr>
<tr>
<td><strong>West End</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hockey Season (17:00 - 03:59)</td>
<td>0.69</td>
<td>1.36</td>
<td>0.83</td>
<td>1.24</td>
<td>0.96</td>
</tr>
<tr>
<td>Hockey Season (04:00-16:59)</td>
<td>0.80</td>
<td>1.23</td>
<td>0.92</td>
<td>1.48</td>
<td>0.96</td>
</tr>
<tr>
<td>Lockout Season (17:00 - 03:59)</td>
<td>0.60</td>
<td>1.45</td>
<td>0.92</td>
<td>1.26</td>
<td>0.94</td>
</tr>
<tr>
<td>Lockout Season (04:00 - 16:59)</td>
<td>0.86</td>
<td>1.23</td>
<td>1.07</td>
<td>1.24</td>
<td>0.93</td>
</tr>
</tbody>
</table>
time category across season types and assaults are similarly underrepresented in the West End. Finally, the other crime category is proportionate throughout.

Variations within and between season types are dependent on crime type and neighbourhood in question. The LTQ above illustrates areas and time frames that have disproportionate amounts of crime compared to the same time frame in other neighbourhoods.

Table 4.12 – Game Time LTQ by Game Day Type

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CBD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>1.00</td>
<td>0.87</td>
<td>1.23</td>
<td>0.69</td>
<td>1.01</td>
</tr>
<tr>
<td>Away</td>
<td>1.08</td>
<td>0.79</td>
<td>1.37</td>
<td>0.76</td>
<td>1.01</td>
</tr>
<tr>
<td>Non-Game</td>
<td>1.10</td>
<td>0.89</td>
<td>1.34</td>
<td>0.83</td>
<td>0.99</td>
</tr>
<tr>
<td>Other Time Period</td>
<td>1.03</td>
<td>0.80</td>
<td>1.42</td>
<td>0.81</td>
<td>1.01</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td><strong>1.90</strong></td>
<td><strong>0.98</strong></td>
<td><strong>0.58</strong></td>
<td><strong>0.37</strong></td>
<td><strong>1.02</strong></td>
</tr>
<tr>
<td>Home</td>
<td>1.37</td>
<td>1.08</td>
<td>0.43</td>
<td>0.65</td>
<td>1.01</td>
</tr>
<tr>
<td>Away</td>
<td>1.92</td>
<td>0.90</td>
<td>0.30</td>
<td>0.23</td>
<td>1.01</td>
</tr>
<tr>
<td>Non-Game</td>
<td>1.69</td>
<td>1.11</td>
<td>0.48</td>
<td>0.48</td>
<td>0.98</td>
</tr>
<tr>
<td>Other Time Period</td>
<td>2.23</td>
<td>0.79</td>
<td>0.74</td>
<td>0.29</td>
<td>1.06</td>
</tr>
<tr>
<td>Downtown South</td>
<td><strong>1.24</strong></td>
<td><strong>1.03</strong></td>
<td><strong>0.68</strong></td>
<td><strong>0.91</strong></td>
<td><strong>1.03</strong></td>
</tr>
<tr>
<td>Home</td>
<td>1.21</td>
<td>1.02</td>
<td>0.55</td>
<td>0.84</td>
<td>1.02</td>
</tr>
<tr>
<td>Away</td>
<td>1.18</td>
<td>0.93</td>
<td>0.52</td>
<td>0.95</td>
<td>1.04</td>
</tr>
<tr>
<td>Non-Game</td>
<td>1.23</td>
<td>0.95</td>
<td>0.52</td>
<td>0.81</td>
<td>1.04</td>
</tr>
<tr>
<td>Other Time Period</td>
<td>1.21</td>
<td>1.01</td>
<td>0.80</td>
<td>0.98</td>
<td>1.02</td>
</tr>
<tr>
<td>False Creek North</td>
<td><strong>1.01</strong></td>
<td><strong>0.79</strong></td>
<td><strong>1.23</strong></td>
<td><strong>1.21</strong></td>
<td><strong>1.02</strong></td>
</tr>
<tr>
<td>Home</td>
<td>0.96</td>
<td>0.73</td>
<td>1.26</td>
<td>1.56</td>
<td>1.02</td>
</tr>
<tr>
<td>Away</td>
<td>0.86</td>
<td>0.80</td>
<td>1.45</td>
<td>1.40</td>
<td>1.01</td>
</tr>
<tr>
<td>Non-Game</td>
<td>0.95</td>
<td>0.81</td>
<td>1.31</td>
<td>1.27</td>
<td>1.01</td>
</tr>
<tr>
<td>Other Time Period</td>
<td>1.11</td>
<td>0.71</td>
<td>1.21</td>
<td>1.08</td>
<td>1.02</td>
</tr>
<tr>
<td>West End</td>
<td><strong>0.71</strong></td>
<td><strong>1.35</strong></td>
<td><strong>0.91</strong></td>
<td><strong>1.40</strong></td>
<td><strong>0.96</strong></td>
</tr>
<tr>
<td>Home</td>
<td>0.69</td>
<td>1.40</td>
<td>0.84</td>
<td>1.15</td>
<td>0.96</td>
</tr>
<tr>
<td>Away</td>
<td>0.65</td>
<td>1.32</td>
<td>0.87</td>
<td>1.17</td>
<td>0.97</td>
</tr>
<tr>
<td>Non-Game</td>
<td>0.71</td>
<td>1.36</td>
<td>0.80</td>
<td>1.31</td>
<td>0.96</td>
</tr>
<tr>
<td>Other Time Period</td>
<td>0.80</td>
<td>1.23</td>
<td>0.92</td>
<td>1.48</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Table 4.12 – Game Time LTQ by Game Day Type divides game time incidents by game day type. What becomes evident from this table is again the continual
overrepresentation of both theft from auto for each category in the CBD and False Creek North, vehicle theft in False Creek North, disorder in the West End, and assaults in Downtown South. The other bar district, the CBD, does not have the same overrepresentation, but is more proportionate. While variations within the neighbourhoods are modest for game day types, identifiable variations do exist. For example, False Creek North has higher levels of vehicle theft and assaults on home game days, and the West End has higher levels of disorder on home game days. It should also be noted that again the other time-band often has higher levels of disorder, vehicle theft and theft from auto, and the other crime category is continually proportionately represented throughout the table.

Table 4:12 – Game Time LTQ by Game Day Type illustrates that the level of crime specialization is dependent on the spatio-temporal variates, given that certain neighbourhoods specialize in certain crimes during specific time periods. The time periods presented above are large and can be further examined at the hourly level.

Given that the primary interest is the effect of the Canuck games on crime patterns, it is logical to assume that the largest crime attractor/generator effect produced by GM Place would be most noticeable in the neighbourhood within which the arena is located, and those neighbourhoods within the immediate vicinity. This assumption is consistent with previous buffer analyses conducted in attractor/generator research (McCord & Ratcliffe, 2008). The neighbourhoods bordering False Creek North, where GM Place is located, are bar districts, and as previous research has shown, such districts tend to result in more violent behaviour, particularly in the late evening and early morning hours. As such, Table 4:13 – Assaults for Selected Neighbourhoods includes LTQs for False Creek North, Downtown South and the CBD, the two neighbourhoods bordering False Creek North for the hours between 19:00h and 04:00h. The table begins at 19:00h to show variation in crimes during the game itself.
Assaults in False Creek North are overrepresented for the time-band 19:00h-22:00 and decrease dramatically thereafter. Home game days are typically more overrepresented for these hours than the other game day types. False Creek North is consistently much more overrepresented than the CBD and Downtown South. However, it is underrepresented between 23:00h-03:59h and considerably less than bar districts.

| Table 4:13 – Assaults for Selected Neighbourhoods |
|-----------------------------|----------------|----------------|
| **Hour/Neighbourhood**     | **Home** | **Away** | **Non-Game** |
| False Creek North          |          |          |                |
| 19:00h                      | 1.42     | 1.25     | 1.50          |
| 20:00                       | 1.33     | 1.37     | 1.36          |
| 21:00                       | 2.01     | 0.81     | 1.68          |
| 22:00                       | 1.51     | 0.72     | 1.18          |
| 23:00                       | 0.70     | 1.02     | 0.66          |
| 00:00                       | 0.99     | 0.84     | 0.98          |
| 01:00                       | 0.52     | 1.01     | 0.77          |
| 02:00                       | 0.71     | 0.59     | 0.78          |
| 03:00                       | 0.74     | 0.80     | 0.77          |
| CBD                         |          |          |                |
| 19:00h                      | 1.07     | 0.92     | 0.81          |
| 20:00                       | 0.89     | 1.10     | 1.06          |
| 21:00                       | 0.79     | 1.06     | 0.84          |
| 22:00                       | 1.02     | 1.12     | 0.96          |
| 23:00                       | 1.23     | 1.32     | 0.97          |
| 00:00                       | 1.23     | 1.13     | 1.09          |
| 01:00                       | 1.24     | 1.15     | 1.08          |
| 02:00                       | 1.14     | 1.09     | 1.17          |
| 03:00                       | 1.09     | 1.17     | 1.19          |
| Downtown South              |          |          |                |
| 19:00h                      | 0.66     | 1.32     | 1.20          |
| 20:00                       | 0.71     | 0.88     | 1.00          |
| 21:00                       | 0.85     | 1.10     | 0.93          |
| 22:00                       | 0.83     | 1.16     | 0.94          |
| 23:00                       | 1.17     | 0.87     | 1.09          |
| 00:00                       | 1.21     | 0.92     | 1.13          |
| 01:00                       | 1.10     | 0.98     | 1.21          |
| 02:00                       | 1.19     | 1.29     | 1.24          |
| 03:00                       | 1.32     | 1.15     | 1.14          |
Assault patterns in the CBD and Downtown South are very similar to one another in that the hours after 23:00h are typically proportionately represented to overrepresented, but the hour with the highest overrepresentation varies dependent on bar district and game day type. The CBD is consistently around 1.2 between 23:00h and 01:00h and Downtown South is noticeably higher at 03:00h on home game days. The other game day types are typically overrepresented in the later hours of the time frame, with the exception of the CBD on away game days at 23:00h.

Aside from assaults, False Creek North has previously shown higher proportions of vehicle theft, and was the only neighbourhood in which these patterns significantly emerged during game time. This deviation from the norm warrants further exploration and is presented at the hourly level below in Table 4:14 – Vehicle Theft for False Creek North.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Home</th>
<th>Away</th>
<th>Non-Game</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:00h</td>
<td>0.93</td>
<td>0.81</td>
<td>1.05</td>
</tr>
<tr>
<td>20:00</td>
<td>1.10</td>
<td>1.80</td>
<td>1.01</td>
</tr>
<tr>
<td>21:00</td>
<td>0.88</td>
<td>0.75</td>
<td>1.05</td>
</tr>
<tr>
<td>22:00</td>
<td>2.07</td>
<td>1.41</td>
<td>1.51</td>
</tr>
<tr>
<td>23:00</td>
<td>2.77</td>
<td>1.98</td>
<td>1.70</td>
</tr>
<tr>
<td>00:00</td>
<td>0.67</td>
<td>2.85</td>
<td>1.46</td>
</tr>
<tr>
<td>01:00</td>
<td>1.92</td>
<td>1.05</td>
<td>0.86</td>
</tr>
<tr>
<td>02:00</td>
<td>1.39</td>
<td>1.92</td>
<td>1.15</td>
</tr>
<tr>
<td>03:00</td>
<td>0.70</td>
<td>1.52</td>
<td>1.61</td>
</tr>
</tbody>
</table>

Unlike the rest of the downtown, False Creek North shows considerable variation for vehicle thefts between game day types. Each day type show similar variations with a higher LTQ during the hours of 22:00h and 23:00h, with home game days seeing an increase to disproportionately high levels again at 01:00h and 02:00h. The patterns for away and non-game days share some similarities to home game days, but show considerable variation throughout the time frame. Away and non-game days have similar
variations with increases to disproportionate levels of vehicle theft at 00:00h and 02:00, and 03:00h, but away game days typically have higher LTQs for these hours. The one exception is the spike on away game days at 20:00h. While all three game day types show some similar patterns, it should be noted that the spike seen on each day type at 22:00h and 23:00h is highest on home game days and the patterns for away and non-game days are more similar to one another than they are to home game days.

This pattern is unique to False Creek North with the other neighbourhoods often showing disproportionately low levels of both vehicle crimes and disorder during the same hours. As such, previous research indicates that there may be higher levels of reporting the following morning, and therefore, the morning hour LTQs for these crimes are presented in Table 4:15 – Morning Hour LTQ for Select Crimes but only generally because of the consistent pattern across the downtown.

Table 4:15 – Morning Hour LTQ for Select Crimes

<table>
<thead>
<tr>
<th>Hockey Seasons</th>
<th>Hours</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>07:00h</td>
<td>1.36</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td></td>
<td>08:00</td>
<td>1.16</td>
<td>1.58</td>
<td>1.42</td>
</tr>
<tr>
<td></td>
<td>09:00</td>
<td>0.95</td>
<td>1.67</td>
<td>1.28</td>
</tr>
<tr>
<td></td>
<td>10:00</td>
<td>1.00</td>
<td>1.64</td>
<td>1.30</td>
</tr>
<tr>
<td></td>
<td>11:00</td>
<td>0.91</td>
<td>1.64</td>
<td>1.16</td>
</tr>
<tr>
<td></td>
<td>12:00</td>
<td>0.89</td>
<td>1.62</td>
<td>1.24</td>
</tr>
</tbody>
</table>

Table 4:15 – Morning Hour LTQ for Select Crimes shows that for each of the selected crimes, the LTQ of reported incidents is higher during the morning hours, with disorder crimes highest at 07:00h and 08:00 and vehicle crimes consistently overrepresented from 08:00h to 12:00h. During these hours, there are often high proportions of reported incidents, but which hours are more overrepresented than others varies between crime types.
CHAPTER 5: DISCUSSION, LIMITATIONS, FUTURE DIRECTIONS, AND CONCLUSION

The purpose of this study is to examine the extent to which GM Place may have a crime attractor/generator effect when a routinely occurring spectator event takes place. It is thought that when the Vancouver Canucks play (a professional hockey team), particularly at home, the number of people and targets in the downtown core substantially increases, and thus, gives rise to both more criminal opportunities and crime events. The latter is believed because it is thought that home games will increase the downtown’s population as people are drawn to GM Place and bars to watch the game, while on away and non-game days, GM Place does not have the same pull increasing the population. The discussion begins with an application of relevant theory at the macro, meso, and micro levels. The results (Chapter 4) indicate that few patterns can be seen – particularly with respect to the away and non-game days and as such, a discussion of the latter is reserved for the end. Limitations, future directions, and a conclusion follow the discussion.

5.1 Discussion

Generally, it is expected that when the Canucks play, particularly at home, crime should increase. It is believed that when the Canucks play at home, GM Place will act as a crime attractor and/or generator, which alters crime patterns throughout the downtown (Brantingham & Brantingham, 1995a). This attractor/generator effect draws large numbers of people, criminal and non-criminal alike, into the downtown on game days, changing the environmental backcloth, opportunity structures, and in result, increasing
the likelihood of the motivated offender, suitable target, and lack of a capable guardian converging in time and space (Cohen & Felson, 1979). These changes in opportunity affect the way the would-be offender processes surrounding environmental cues, which influence his/her state of readiness and the various decision-making processes engaged in prior to the criminal event (Cornish & Clarke, 1986).

This decision making process can be premeditated (long and drawn out) or occur in a matter of seconds or "in the moment" (Brantingham & Brantingham, 1993a). For the crime attractor effect, would-be, highly motivated offenders, already in a state of readiness and have a pre-conceived set of factors, that if they converge in time and space, they will commit a crime. For these would-be offenders, the areas they believe offer criminal opportunities, have probably been discovered through their daily routine activities and the area is part of their awareness space, for example, car theft (Brantingham & Brantingham, 1993b).

The decision to exploit a criminal opportunity does not have to be pre-planned; it can occur moments before the criminal event (Cornish & Clarke, 1986). Such a decision making process is more likely to be a result of a crime generator effect. People may enter the downtown devoid of criminal intent, but through interacting and moving across time and making use of facilities at activity nodes, the necessary environmental cues become manifest, which result in unintended criminal activity (Brantingham & Brantingham, 1993b). Location, time, and offence templates (which mediate target suitability) are among the environmental cues interpreted by the would-be offender, thereby affecting decision-making processes, and therefore, the criminal event. Depending on the extent to which GM Place’s crime attractor/generator effect alters routine activities and crime opportunities, changes in crime patterns may be more or less visible depending on the level of analysis, and as such, the outlined theory is applied at the macro, meso, and micro levels.
5.1.1 Macro Level

The macro section draws heavily on routine activities theory (Cohen & Felson, 1979) as the expectation is that the attractor/generator effect at GM Place produced by the presence of Canucks games results in a sufficiently large change in routine activities to noticeably alter crime patterns in the downtown core. This expected pattern should become visible in comparing the hockey seasons to the lockout season. The change in macro level routine activities caused by the attractor/generator effect of GM Place should result in a higher level of reported crimes because of the influx of people into the downtown core caused by Canucks games.

Certain types of behaviours are expected at GM Place and in the surrounding areas (including two bar districts) because of the nature of the activities. Hockey games and bar districts are often characterized by alcohol consumption and potentially antagonizing behaviour between rival fans on game days. This behaviour changes the backcloth, thus revealing crime opportunities at these attractors and generators, particularly for street disorder and assault in close proximity to these facilities. The sheer influx of people and vehicles changes the backcloth and increases opportunities for planned and unplanned vehicle crimes as potential offenders encounter unguarded targets. These events and land-uses draw both criminal and non-criminal populations, and in turn, change crime opportunity structures so that it is more likely that the motivated offender, suitable target, and lack of a capable guardian convergence in time and space. Based on these routine activities, a certain degree of predictability of the criminal event is possible.

At the macro level of analysis, Canucks hockey seasons are compared to the 2004/2005 lockout season wherein no games were played, and therefore, was used as a pseudo-control. In examining these differences by season, it became evident that there is little discernable difference in the season types as the lockout season was not
dissimilar from the hockey seasons. The geographic distribution of crime also follows the
same pattern between the season types for total crimes of interest. This is likely because
when the Canucks were not playing, GM Place and other venues hosted events in lieu of
hockey, and this idea is supported by the fact that the lockout season has more crimes
per day for assault, disorder, and vehicle theft, although the differences are minimal. As
such, the environmental backcloth was not altered to the point that a significant
difference in opportunity structures is evident. It is also likely that these venues and the
downtown core itself have a greater attractor/generator effect absent of Canucks games.

Overall, the differences are marginal and the emerging pattern supports the
theory outlined above. Table 4:5 – Difference in Average Crimes per Day by
Neighbourhood shows that in False Creek North, the crimes per day are consistently
higher during the hockey seasons. The LQs show a similar distribution of crime across
the downtown core to the crimes per day findings. The LQs overall indicate that in many
cases there is little if any difference between the season types, again indicating that
these areas likely have attractor and/or generator effects absent of the Canucks games
at GM Place. Theoretically, we would expect to have higher levels of certain crimes in
certain neighbourhoods and the results support this theory; for example, the bar districts
have a disproportionate amount of assaults because they both attract and generate such
behaviour. The West End and False Creek North – areas characterized by a lot of
available parking opportunities (and residential in the West End) – have
disproportionately high levels of vehicle theft (but have even higher levels of vehicle theft
during the hockey seasons), a finding in support of routine activities theory and crime
patterns theory.

Differences between the season types are sporadic and minimal. This is likely
because the environmental backcloth and environmental cues therein do not change
dramatically enough on the macro level to affect crime patterns. This suggests that
regardless of season type, the necessary cues and opportunities remain for the would-be offender and do not change to the extent that they affect the decision making processes of the would-be offender to reduce the occurrence of the criminal event.

However, the fact that certain neighbourhoods have higher crimes during the hockey seasons lends credence to the idea that hockey games in GM Place do act as crime attractors and/or generators to at least some degree\(^\text{16}\). If nothing else they result in an increased number of individuals travelling through this space, increasing the likelihood that the elements of RAT coming together (Cohen & Felson, 1979). At a macro level, it appears that Canucks games do not have the attractor and generator effect expected, but given the variations between season types, the environmental backcloth and opportunity structures change sufficiently to alter the spatio-temporal distribution of crime to some degree.

While crimes per day (00:00h – 23:59h) show little variation between the seasons, that time band is rather broad and does not examine the potential crime attractor/generator effects that may continue past 23:59h into the next morning. As such, the game time analysis was included for the period of 17:00h-04:00h time frame during which theory suggests we should see increased levels of the crimes of interest attributable to GM Place. While the results are again modest, they are in the expected direction. When bar districts share disproportionate accumulations of assaults, it is likely due to their generator effects, and the same is true for the disproportionate share of vehicle theft in the West End and False Creek North, and theft from auto in the CBD and False Creek North. These neighbourhoods attract people for one purpose, acting as a crime generator, and while in the area, the necessary environmental cues are assessed, resulting in the decision to offend.

\(^{16}\) Locations categorized as a crime attractor or generator is further discussed below.
While it is evident that the presence of the Canucks season has some effect on opportunity structures and how the would-be offender interprets surrounding environmental cues leading to the criminal event, the attractor/generator effect is not so prominent that it considerably and consistently alters macro level crime patterns. The variations between the season types and locations indicate that GM Place during the Canucks season is not the only attractor/generator effect occurring in Vancouver's downtown core. The variation can be explained by other events hosted in lieu of Canucks games, resulting in a similar criminal and non-criminal population, crime opportunities, and crime patterns.

5.1.2 Meso Level

At the meso level, the theoretical assumptions made at the macro level apply; the presence of the Canucks games are expected to result in higher levels of crimes due to the attractor/generator effect caused by GM Place. However, at the meso level, this can be further refined: it is expected that there will be higher reported incidents on home game days followed by away, and non-game days due to the change in criminal, non-criminal, and target populations. It is expected that home game days draw larger numbers of people and vehicles (Andresen, forthcoming) to the downtown core because of the presence of the Canucks, and that these populations are smaller still on away and non-game days. It is expected that the crime attractor and generator effects will vary in intensity by neighbourhood, crime type, day type, and time of day. GM Place should potentially have an increased attractor, but more likely a generator effect when the Canucks play at home for assaults across the downtown, but particularly in the bar districts and in False Creek North due to the opportunistic nature of the crime. It is likely that bars reach capacity on home game days and while many or nearly all individuals frequent bars devoid of intent, they may consume alcohol (at the game itself, a at a
nearby bar after the game for example) and a situation may arise, and due to their inebriated state, they engage in a decision making process which results in physical confrontation.

Disorder crimes are expected be spread across the downtown core because it is a very opportunistic crime that may be committed on the way from one activity node to the next (Bromley & Nelson, 2002), but should be higher in highly residential areas because these crimes may be less tolerated and more often reported. Furthermore, these crimes should generally increase on home game days when bars are at capacity and especially when many have similar closing times (Rossmo 1994 as cited in Block & Block, 1995). It is therefore expected that the presence of a home game will have a general crime generator effect for disorder crimes in the downtown core due to an increase in potential offenders and suitable targets that will converge, eventually, with each and other with a simultaneous lack of effective guardianship.

Finally, it is expected that vehicle crimes will be highest on home game days in False Creek North because of the available parking, and similar amounts of reported incidents should come from those neighbourhoods with more available parking and vehicles, such as the West End and generally, these days will have an attractor/generator effect for the entire downtown. However, the highest levels of vehicle crimes are expected in False Creek North because GM Place will act as a crime attractor for highly motivated offenders in a state of readiness, who seek out their targets, and are aware that more suitable targets without capable guardians (Cohen & Felson, 1979) are present on home game days.

In this respect, hockey games may also have a generator effect across the downtown and again, particularly in those neighbourhoods with higher numbers of vehicles. For example, in Vancouver, many thefts from auto are a result of chronic drug users who commit property crimes such as breaking into vehicles to steal anything to
help sustain their habit (Gordon & Kinney, 2006), and these offenders, one can speculate, may be highly motivated and therefore go to GM Place to steal from the mass of relatively unprotected and usually large number of targets. It is possible for individuals who are not highly motivated, or even in a state of readiness, who, travelling between activity nodes encounter a suitable target and quickly make the decision to break into, or steal a car similar to those who engage in disorder crimes (Brantingham & Brantingham, 1993b, Bromley & Nelson, 2002). Again, drug users may get high, may not intend to commit a crime, but realize they need another “fix” and take advantage of the opportunities generated across the downtown by a home game. The same theoretical foundation applies to the away and non-game days, but it is expected that reported incidents would be lower on these days due to the lack of a generator/attractor effect produced by GM place on home game days due to the attractor/generator effect produced by the downtown core (Brantingham & Brantingham, 1995a).

The meso level analysis revealed mixed results with some following theoretical expectations, while others did not, and is best discussed by using Table 4:12 – Game Time LTQ by Game Day Type. It was found that assaults do not vary as expected. Only Downtown South shows disproportionately high levels, but this rise is not limited to home game days; while the other bar district, the CBD is proportionate across game day types, as is False Creek North, with negligible differences between the game day types within the neighbourhoods. It is possible that the activities hosted by the bars in Downtown South attract a certain type of clientele who is more likely to engage in violate behaviour. Conversely, it is possible that the CBD and False Creek North generally do

17 Downtown South has similarly disproportionate levels of assault during the other time category as well which could be a result of the area also being a shopping district and bordering the Vancouver Court House, which results in higher levels of traffic throughout the day and therefore increased opportunities. The area of Granville St. heading towards the bridge is also a rougher neighbourhood where one could expect higher levels of assaults.
not attract the same type of clientele, which results in fewer motivated offenders, and in turn, criminal events.

The findings for disorder are both expected and unexpected. The studied neighbourhood furthest from GM Place, the West End has the highest levels of disorder and is highest on home game days, but unexpectedly, none of the other neighbourhoods experience disproportionate amounts of disorder. This may be a function of high residential densities in the West End in that there are more guardians, who, in this case, are incapable at proactively preventing crime, but have a reactive effect in that they report incidents to the police. On home game days, this disorderly behaviour increases as it is plausible to assume people returning to their residences after the game may be engaging in such crimes on route between nodes (Bromley & Nelson, 2002), and in turn, so too do reports of disorder. This pattern supports the idea that GM Place may have, in this case a generator effect on the entire downtown core.

Theft from auto presents an interesting pattern. It is disproportionately high in both the CBD and False Creek North for each game day type and little variation exists between the day type and neighbourhoods, while it is underrepresented in the other neighbourhoods. If theft from auto is disproportionately high in two neighbourhoods, then it must be lower in others because there are limits on proportions unlike crime rates and raw counts. This pattern detracts from the attractor/generator theory of GM Place on home game days\textsuperscript{18}, but lends support to the notion that it may be more a function of a presence of continuous opportunities in these areas as they may have a great deal of available, unguarded parking, such as parking garages or open lots.

Particularly interesting are the disproportionately low levels of theft from auto in Downtown South. This could be for a few reasons. First, there may be less available and/or unguarded parking and therefore, fewer suitable targets. Second, while this area

\textsuperscript{18} Thefts from auto are highest on non-game days in the CBD and away game days in False Creek North.
may act as an attractor and generator for assaults, the same young adults who are
drawn to the area may act as capable guardians preventing thefts from auto in more
visible parking lots (Rengert, 1997). Finally, it is also possible that there are more
opportunities for theft from auto in the CBD because of its proximity to the DTES, where
it is believed there is a higher population of those individuals who may break into cars to
steal to sustain a drug habit are active. The CBD may be within the awareness space of
these individuals (Brantingham & Brantingham, 1993b) and higher thefts from auto may
also be a function of distance decay, that is, individuals are more likely to commit crimes
closer to one of their primary activity nodes such as a residence (Brantingham &

Perhaps the most significant finding at the meso level is one that follows
expected theory, vehicle theft in False Creek North is highest on home game days
followed by away, and then non-game days. Vehicle theft in False Creek North is 15 to
20 per cent higher on home game days than the other game day types within that
neighbourhood and 40 per cent higher than the next highest LTQ for vehicle theft on
home game days, in the West End and up to 75 per cent higher than other
neighbourhoods. Away game days are also consistently and significantly higher than the
other neighbourhoods, while the West End has a higher LTQ, by 4 per cent (1.31) on
non-game days. This pattern of continual overrepresentation of vehicle theft in False
Creek North indicates that GM Place, regardless of the presence of a home game, likely
has a crime attractor effect, but nevertheless, the presence of a home game
exacerbates this effect to such a degree that the environmental backcloth is changed –
altering routine activities, travel paths and behaviours, therefore producing higher levels
of crime.

While many of the findings above were unexpected, such as the marginal
differences between game day types it is entirely possible that these are a result of
ubiquitous crime opportunities due to land use and other characteristics of the local
neighbourhoods and not a crime attractor/generator effect solely produced by GM Place
on home game days that drastically alter the population at risk and the environmental
backcloth. These unexpected findings were produced at the meso level and the effects
of the spectator event on crime patterns cannot be wholly assessed without examining
the specific hours most likely to change as a result of the attractor/generator effect,
between the hours of 17:00h and 03:59h. Given that much of the literature examined
above found spikes in different crimes between 22:00h and 03:00h, further exploration
into micro levels of crime patterns is warranted.

5.1.3 Micro Level

At the micro level, the rationale applied to the meso level is continued and further
developed. Given that assaults are one of the most temporally accurate offences, as
shown above, we can expect to see disproportionate amounts of assaults in the bar
districts after the game ends and into the early hours of the morning, because bars act
as crime generators and even attractors for those who wish to fight. False Creek North
may see increases in assaults during and immediately after the game because GM
Place can also act as a crime generator for fighting, perhaps between rival fans, and
especially when alcohol is involved (Cherpitel, 1993). It is expected that the bar districts
should see higher levels of crime between 22:00h and 03:00h as extant literature
indicated above, but this should be accentuated on home game days. For disorder and
vehicle crimes, it is likely, that on average, there will be fewer reports of these crimes
during the game time period. This is because such crimes are likely to be reported when
people return to their property to find it damaged or missing, and therefore, a
disproportionate share of these crimes should be reported the next day (Ratcliffe, 2002);
this is particularly true in those areas with higher numbers of cars for vehicle crimes as these will have the same aforementioned attractor/generator effect.

There is however, an exception to this expectation. While certain areas are crime attractors, so too are certain times; specifically the time in which the game is played, approximately 19:00-22:00h. Highly motivated offenders may be aware that during this time more suitable targets are lacking guardians, thereby giving them an ideal chance to steal or steal from vehicles, and thus a spatio-temporal generator and attractor effect emerges in result of the hockey games. Therefore, reported crimes should follow routine movements as people leave the game and return to their vehicles to find them damaged or missing. Higher levels of reported incidents should immediately follow the game and perhaps a few hours after the game ends because people may go out after the game, returning in the early hours of the morning to find their cars stolen or damaged. Theoretically, a disproportionate share of these crimes should occur in False Creek North and those bordering neighbourhoods, while the remainder of the crimes will be reported the next morning.

Hourly analysis of LTQs in the downtown between season types reveals what is theoretically expected and has been explained in previous research; the hours of 22:00h-04:00h experience disproportionately high levels assault and are underrepresented during day time hours while the reverse is often true for disorder and both vehicle crimes. Particularly interesting is that False Creek North has disproportionate amounts of assaults during the game itself, and significantly higher than those proportions of the bar districts for the same time period. This indicates GM Place has a crime generator effect for this crime. It is both expected and unexpected. Hockey games result in rival fans and alcohol consumption, which could lead elevated levels of violent behaviour. For example an intoxicated individual may spill beer on another, which acts as a triggering event for a fight (Brantingham & Brantingham, 1993a). Higher levels
of assaults were not expected during this time because it was believed that such crimes would be dealt with by in-house security and therefore not reported (Russell, 2004). It is distinctly possible that individuals or police present during the game do in fact report these incidents and that perhaps those who attend the game are more likely to engage in violent behaviour while at the venue.

What is particularly interesting are the disproportionate amounts of assaults seen on home game days in False Creek North for 19:00h to 22:00h because they are significantly higher than the same hours in the CBD and Downtown South. This could be a result of opportunity and clientele. During the game at GM Place, it is likely that there are more individuals drinking at that location than at surrounding bars showing the hockey game on TV. It is also possible that due to the capacity, there are simply more people drinking at GM Place who are willing to engage in violent behaviour than at nearby bars because during the game, it is likely people remain in the bars, not spilling out onto the street, which reduces opportunities for violence in the establishment itself. Therefore, there are more opportunities for violence at the venue than at the bars due to the potential differences in the characteristics of the locations. During the game, the backcloth in these different locations could be significantly different. The generator effect seen in False Creek North could be a result of the nature of being at a hockey game, in that the atmosphere, consumption of alcohol, and the like, create an environment that affects Canadian hockey fans much like soccer affects its fans elsewhere in the world.

This generator effect is not quite as evident in the bar districts. More often than not, there are higher LTQs on home game days, but the differences are marginal and inconsistent indicating that the attractor/generator effect may be that of the bar district rather than GM Place. The bar districts are typically overrepresented for assaults between 23:00h and 03:00h. This is consistent with routine activities as people frequent these bars (the generator effect), drink, and as areas with high alcohol outlet densities
(Britt et al. 2005; and Zhu, Gorman, & Horel, 2004) lead to violence and this violence can be exacerbated when many bars in close proximity to one another have similar closing times (Rossmo, 1994 as cited in Block & Block, 1995). High alcohol outlet density and similar closing times lead to increased interaction and the likelihood that a motivated offender, suitable target, and lack of a capable guardian converge in time and space (Cohen & Felson, 1979). These patterns are not altered enough on home game days to make the assumption that it is due to an increase in populations at risk resulting from the influx of people to watch a home game, but rather, the overrepresentation of assaults during this period is a result of the already established generator effect produced bars.

The latter is, however, untrue for disorder and vehicle crimes. These crimes are often proportionate or are underrepresented across the downtown core during the game time period, but generally show disproportionate amounts of reports during the morning hours from 07:00h to 12:00h as depicted in Table 4:15 – Morning Hour LTQ for Select Crimes. Theoretically, we can expect that particularly on home game days with an increased population, it is likely an attractor and generator effect is produced in the downtown. This effect results in disorder and vehicle crimes being committed by the highly motivated offender, or by the intoxicated, more opportunistic offender travelling between nodes in the evening hours. However, because these crimes do not have witnesses, it is likely they are not reported until the next day when people discover they have been victimized (Ratcliffe, 2002).

The biggest exception to the pattern stated above, and perhaps the most significant finding in this analysis surrounds vehicle thefts in False Creek North. Table 4:14 – Vehicle Theft for False Creek North below illustrates this finding. While there are consistently disproportionately high levels of vehicle theft in False Creek North across each game day type, the pattern on home game days is particularly instructive as it is
during this game day type that the population at risk is expected to be highest, and in this case, with more vehicles parked at GM Place and in the immediate vicinity.

While the pattern is somewhat similar across game day types, the time between 21:00h and 22:59h are extremely overrepresented for vehicle thefts and significantly more so than the other game days. This follows the theory that GM Place acts as a crime attractor, which results in many vehicle thefts during the game and higher reported incidents follow routine movements because there are fewer reports of vehicle theft during the game itself, but as the game lets out around 22:00 and people return to their cars, there is a significant increase in reported incidents compared to the other game day types. There is also peak at 01:00h and 02:00h, which again follows routine activities in that individuals may go out after the game, return to their cars later in the same evening again, only this time to find it missing and report it to the police. It is this finding that lends the most support for the theory that the presence of a Canucks game alters the environmental backdrop and opportunity structures sufficiently enough to show important changes in crime patterns. These findings show the value of the LTQ. The numbers presented above show that when compared with not only the other hours of the day, but to the greater downtown core at these times, this location, has a disproportionately high share of vehicle theft, giving us insight to the temporal variations in the crime attractor/generator theory.

It should be noted however, that due to the routinely occurring nature of hockey games, it is more likely that GM Place can act as a crime attractor for highly motivated offenders, particularly for vehicle crimes. It is common knowledge when the Canucks are playing and thus, such offenders could pre-plan their crimes. Vehicle crimes do not have to be premeditated for an attractor effect to occur: would-be offenders in a state of readiness may not be aware ahead of time of a home game, but there are many cues that become manifest downtown when they do occur, such as fans wearing Canucks
jerseys entering the downtown. This may result in would-be offenders interpreting these facts and engaging in the decision-making process resulting in committing a vehicle crime at or near GM Place. The latter may explain why vehicle theft patterns were so much higher on home game days at particular times than the other game day types.

The primary concern within this analysis is how the presence of a Canucks game, particularly at home, influences crime patterns because it is a home game which will most likely change routine activities and populations at risk that results in noticeable changes in reported incidents. The latter proved to be true at many levels as was explained above. The most noticeable difference was between home game days compared to the other two game day types. It appears that away and non-game days are more similar to one another than they are to home game days, which is theoretically sound. No particular pattern emerged with regard to which non-home-game day has higher levels of crime; there was a great deal of fluctuation.

Unfortunately, the data required to better assess the activities on these days are unavailable for this analysis and this limitation is discussed below. For example, Table 4:14 – Vehicle Theft for False Creek North, shows considerable variation in vehicle theft in False Creek North during the away and non-game days with some of these hours having higher LTQs than the home game days. These fluctuations may be a result of other events with different end times occurring at GM Place or BC Place when the Canucks are not playing which could account for different over and underrepresentation of vehicle theft throughout this time frame. Theoretically, if there are events occurring on these days, the populations entering the downtown could be similar to those on home game days, which in turn, alters the environmental backcloth and opportunity structures similar to what they are on home game days. It is also possible that more criminal opportunities are created, which could explain those instances when the home game
days do not have the highest reported incidents, and is something that should be explored in future studies.

5.2 Limitations

While the findings above are exploratory and show modest support for environmental criminological theory, invariably there are a number of limitations to the study. The first is within the data themselves. The VPD CAD data is based on emergency 911 calls that are then re-routed to the VPD for dispatch. This means that we only have exact times of crimes for those crimes with witnesses, in this case only assault, and as such, we do not always know exactly when disorder crimes, theft from auto, and vehicle thefts occurred (Ratcliffe, 2002).

A further limitation as is true with any use of police data, is that we only have the crimes that were reported to, or discovered by police. The dark figure of crime, those crimes that go unreported to the police, and cannot be accounted for. Often disorder crimes and thefts from auto are not reported because people do not feel the police can do anything, while vehicle theft are almost always reported to police if nothing more than to be able to claim insurance compensation (Gordon & Kinney, 2006). Although CAD data are all crimes reported to police, but not all crimes, giving what is essentially a sample of all crimes that are occurring during this study period.

Another limitation is found within the use of the LCLB data. Data are only available for the year 2006, although this study period spans seven years. This is not problematic given it is likely that the land uses have not changed, however, it should be noted. This is typical of GIS data. Road networks (used to generate locations) are notoriously dated – even within the year they are published. But, for the purposes of this study, these problems are insubstantial.
Perhaps the biggest limitation to this study is the lack of information regarding events occurring on the non-home game days. Previous researchers also identified the same limitation but did not see the need to perform controls either (Lin, 2007; Rees & Schnepel, 2008). But certainly, a more situationally-focussed method certainly would be a useful next step. The inability to control for other events may have greater effects on this study than others due to the presence of two large venues in close proximity of one another in the downtown core. Given that the differences found above between the game day types were minimal and sporadic, it is distinctly possible that when the Canucks are not playing at home, other large events are being hosted at both GM Place and BC Place.

Other events also have implications for calculating the population at risk for non-home game days and home game days when there is an event at BC Place coinciding with a home game. With the combined seating capacity of approximately 90,000 between the two venues, it is possible that an away or non-game day may see a higher population in the downtown core than on a home game day. Another possibility is that if an event at BC Place is occurring the same time as a Canucks game, such as a BC Lions game during the Canucks early season, there may be significantly more people in the downtown core. In essence, it is possible that the population at risk only varies slightly between these game day types. These are only two, although the largest, venues in the downtown core, there are others which could also affect the population at risk. The scope of this thesis further limits the analysis, but many possibilities exist, as the data are conducive to many forms of analyses.

Finally, an additional limitation related to the populations at risk is the effect of public transit on the spatial and temporal distribution of crime was not examined. Buckley (1996) found that generally, the presence of a Skytrain (rapid transit) stations throughout Metro Vancouver may increase crime in the surrounding area. There are
three Skytrain stations in the downtown core, Burrard station, Granville station, and the
Stadium station, located in Falsecreek North, which may add or detract from the
attractor/generator effect produced by GM Place.

5.3 Future Directions

While this study did suffer from limitations, those may be remedied or at least
reduced in subsequent studies. Limits within the data are hard to remedy, but
supplementing it with other techniques and data could help better depict when and the
amount of crimes that are occurring. To deal with the issue of when many of these
crimes are occurring, aoristic analysis could be used because it “generates a probability
estimation that an event or number of events occurred within user specified temporal
parameters based on the overlap between the search time frame and the time span of
each incident” (Ratcliffe, 2002, p. 26-27). Aoristic analysis could help determine when
the theft from auto, vehicle theft, and disorder crimes may have actually occurred.

The lack of a numerical estimate of the population at risk may be seen as a
limitation; however, the purpose of its inclusion in this thesis was to hypothesize how a
change in population could affect crime patterns. In a future study, including proper
estimates would be beneficial. One possible measure could be the LandScan’s Global
populations at risk estimate discussed above. If the technique becomes sophisticated
enough to measure micro-temporal population changes it could be very valuable to
future studies.

Currently however, the population at risk estimate could be improved by including
a qualitative component to determine how full the bars get on the different days of the
week and different game day types and the type of behaviour that results. Also the same
method could be used to determine how many food primary establishments show the
game and fill up on game nights. The population at risk data should also be modified for
the different game day types on the weekend and weekdays because each will affect the
population at risk regardless of the presence of a hockey game. A further way to
enhance the population at risk includes obtaining more data about other events
occurring in the downtown.

Obtaining data on other ongoing events, could not only allow us to better
estimate the population at risk, but we may be able to account for the marginal and
sporadic differences found between game day types. It is distinctly possible that there
are other events going on which result in population at risk that is roughly equal for each
game day type and in turn, creates a consistent level of opportunity, which could explain
the similarities.

The scope of this thesis limits the analytic possibilities to be conducted herein.
Many of the techniques used above could be expanded and applied on more levels. For
example, the LTQs could have been presented for each hour on each day type for each
neighbourhood in the downtown core. Differences may exist between season types, that
is, the pre-season, regular season, and playoffs. Examining differences between
weekend and weekday in the future may be a very beneficial distinction. Many games
are played on Friday and Saturday nights and this could result in higher levels of crime.
The crimes of interest could be expanded to include other crimes of interest to a
researcher. This analysis could also have been expanded to include more of Vancouver
and not just the downtown. In doing so, we could examine whether, for example, B&Es
increase on home game days while the game is on because the house may be vacant
while the occupants watch the game as Lin (2007) reported.

Other techniques may also be employed in the future. The use of buffers and
LQs may be used to examine more precisely whether proximity to the venue has any
effect on crime patterns in the immediate vicinity. This technique was not employed in
the current analysis because of the exploratory nature of the study and the data. The
method used here enables discussion of how different land uses may affect crime patterns. The neighbourhoods used within are meaningful to local agencies that may have an interest in this study for crime prevention purposes. Further, as these neighbourhood units were used, the most appropriate analytical technique is the LQ and its derivative, the LTQ. Using buffers in the current analysis would make an explanation based on characteristics of the buffers unnecessarily difficult for an exploratory study.

While the above did find increases in certain crimes on home game days over other game day types and during certain time periods and hours of the day, the interpretation of the significance of these differences was contextual, limited to an assessment made by the researcher. A future study could incorporate statistical techniques such as an analysis of variance to determine if the differences between the game day types are statistically significant. Furthermore, the Canucks schedule data were not used to its full potential, as many of the other included fields are conducive to statistical analyses. A regression model could be created to determine if a win, loss, or opposing team (a rival for example) has an effect on crime rates as has been conducted in other studies (Rees & Schnepel, 2008). These tests could be conducted at different temporal periods; weekends versus weekdays, or between season types (regular and playoff) for example. This dataset is large and the current analysis only explored potential analytic strategies that may be applied, numerous additional possibilities exist.

While Central Waterfront often showed extreme differences between the hockey and lockout season, and between game day types, these differences may in part be due to its proximity to the DTES, which was excluded from this study. In light of this, a future study may wish to include the DTES because it is possible the presence of a Canucks game affects the levels of crime in that area by local residents and patrons who regularly frequent the DTES. Furthermore, it is also possible that crime opportunities are encountered and created by those who travel through the DTES to reach their next
activity node, while it is also possible that some individuals may park in this
neighbourhood, giving rise to more opportunities for vehicle crimes.

5.4 Conclusion

The purpose of this analysis was to explore the effects the presence of spectator
events on crime patterns with a focus on Vancouver’s downtown core and the attractor
and/or generator effects at GM Place produced by a local NHL team – the Vancouver
Canucks. Through using theories of environmental criminology, with a particular focus
on how the environmental backcloth is altered by crime generators and attractors, in this
case, GM Place, the effects of the Canucks on crime patterns were explored.

It was expected that the presence of the Canucks would change routine activities
at a large enough scale to show a difference in crime patterns, particularly on home
game days versus, away, and non-game days, but also between the hockey seasons
and the lockout season. It was hypothesized that GM Place would act as a crime
attractor and generator (Brantingham & Brantingham, 1995) for the entire downtown
core because the games would change the population at risk, drawing large numbers of
people into the core. Although many would be devoid of criminal intent, the result of this
influx of people and vehicles is that it sufficiently changes opportunity structures for the
convergence in time and space of the motivated offender, suitable target, and lack of a
capable guardian, thereby increasing reported incidents of assaults, disorder, theft from
auto, and vehicle theft. For the would-be offender, particularly the motivated offender,
the change in opportunities as a result of hockey games would create the necessary
environmental cues for the offender in a state of readiness to engage in criminal activity
(Brantingham & Brantingham, 1993b; Cornish & Clarke, 1986).

In examining the macro differences between seasons using crimes per day, it
was found that there is a minimal difference between season types, indicating that the
presence of the Canucks does not alter the environmental backcloth and opportunity
structures significantly enough to show a great deal of variation. Similar findings were
presented in examining the differences between game day types across the
neighbourhoods of the downtown core, with the exception that home game days show
slightly higher crimes per day than the not-home game days, dependent on the
neighbourhood and crime in question, while the pattern remained consistent in False
Creek North. While the differences were minimal, they nonetheless exist and were
expected.

These findings were then explored through the location quotient and location
time quotients to examine the spatio-temporal effects of the Canucks games on crime
patterns. It was found that LTQs were dependent on crime, time, and place. Perhaps the
most notable finding to support the crime attractor/generator effect produced by GM
Place was seen on home game days. Its effects on crime in the downtown are
particularly evident in the hourly fluctuations of the LTQ seen in False Creek North.
These changes follow routine movements surrounding the hours in which the Canucks
game would be played. For example, False Creek North showed lower LTQs for vehicle
thefts during the hockey game because people are busy watching the game, but in the
hours immediately following the game, there is a dramatic spike in reports of vehicle
thefts as people return to find their vehicles missing. Such reported incidents follow
routine movements as expected in this time and space.

Previous research has shown the LQ to be a useful tool in exploring crime
attractors and generators (Andresen, 2007; Brantingham & Brantingham, 1993c, 1995b;
McCord & Ratcliffe, 2007). The LTQ is a derivative of the LQ, and encompasses all the
benefits of the LQ, including helping to identify where crime attractors and generators
are located, but it also helps identify temporal periods or hours when these attractors
and generators have the highest crime attracting and generating effects when compared
to the greater catchment area at that particular time (Robinson, 2008). Through routine police work, police are probably aware of the where and when crimes are likely to occur, but being able to quantify what they know through observation, may be useful in affirming their suspicions, thereby helping them influence crime prevention initiatives they anecdotally know are needed.

While the analysis focussed on a routinely occurring spectator event, NHL hockey games, these variables and theory have broader applicability to festivals, concerts, and any other event that draws large numbers of people into a single geographic location. While the presence of Vancouver Canucks home games cannot explain changes in crime patterns alone, there is little doubt that they have a crime attractor and generator effect on the downtown core, altering the environmental backcloth. The attractor and/or generator effect produced by GM Place on home game days, in addition to other factors, such as the surrounding land-uses, populations at risk, time of day, the presence of other crime attractors and generators, and the greater social context within which they occur, coalesce to influence crime patterns. These variables should be considered in assessing the effects of any spectator event, keystone, routinely occurring, or otherwise, and may be a pressing and substantial concern to those planning for the upcoming 2010 Olympics hosted in Vancouver.
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APPENDIX A: FORMULAE

Equation 5:1 – Crimes of Interest Variable Recode
= IF(OR(M3="ASLT", M3 ="ASLT1", M3 = "PASLT", M3 ="PASLT1", M3 ="ASSA", M3
="ASSAI", M3= "KNIFE", M3 = "PKNIFE", M3= "ASSAW", M3 = "ASSAWI", M3=
"WEAP", M3= "STAB", M3="PSTAB", M3="PFIGHT", M3="FIGHT", M3="PGUN",
M3="GUN"), "Assault", IF(OR(M3="TFAUTO", M3=="PTHEFA", M3="THEFTF"), "Theft
From Auto", IF(OR(M3= "STAUTO", M3="PTHEF1", M3="THEFVI", M3="BAIT",
M3="PVEHS", M3="THEFV"), "Vehicle Theft", IF(OR(M3= "ANNOY", M3= "PANNOY",
M3="PANHA", M3="KPEACE", M3="PKEEP", M3="NEIGHD", M3="ASSISG",
M3="MSCHF", M3="PMISC", M3="MISCH", M3="MSCHF1", M3="MISC1",
M3="MISCHI", M3="NOISE", M3="PNOISE", M3="DISTN", M3="DISTP", M3="PROST",
M3="PPROST"), "Disorder", FALSE))))}
APPENDIX B: TABLES

Appendix Table 1 - Game Day Types per Season

<table>
<thead>
<tr>
<th>Season</th>
<th>Total Days</th>
<th>Home Games</th>
<th>Away Games</th>
<th>Total Game Days</th>
<th>Total Non Game Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000/2001</td>
<td>195</td>
<td>42</td>
<td>43</td>
<td>85</td>
<td>110</td>
</tr>
<tr>
<td>2001/2002</td>
<td>206</td>
<td>44</td>
<td>44</td>
<td>88</td>
<td>118</td>
</tr>
<tr>
<td>2002/2003</td>
<td>211</td>
<td>49</td>
<td>47</td>
<td>96</td>
<td>115</td>
</tr>
<tr>
<td>2003/2004</td>
<td>194</td>
<td>45</td>
<td>44</td>
<td>89</td>
<td>105</td>
</tr>
<tr>
<td>2004/2005</td>
<td>200</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>2005/2006</td>
<td>184</td>
<td>37</td>
<td>40</td>
<td>77</td>
<td>107</td>
</tr>
<tr>
<td>2006/2007</td>
<td>210</td>
<td>47</td>
<td>46</td>
<td>93</td>
<td>117</td>
</tr>
<tr>
<td>Totals</td>
<td>1400</td>
<td>264</td>
<td>264</td>
<td>528</td>
<td>672</td>
</tr>
</tbody>
</table>

*Note that 2004/2005 is the lockout season*

Appendix Table 2 - Crime Counts per Season

<table>
<thead>
<tr>
<th>Season</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000/2001 Season</td>
<td>1377</td>
<td>3807</td>
<td>3690</td>
<td>715</td>
<td>21132</td>
<td>30721</td>
</tr>
<tr>
<td>2001/2002 Season</td>
<td>1398</td>
<td>4067</td>
<td>4805</td>
<td>779</td>
<td>24515</td>
<td>35564</td>
</tr>
<tr>
<td>2002/2003 Season</td>
<td>1490</td>
<td>4483</td>
<td>2808</td>
<td>1066</td>
<td>21480</td>
<td>31327</td>
</tr>
<tr>
<td>2003/2004 Season</td>
<td>1890</td>
<td>5123</td>
<td>2886</td>
<td>1177</td>
<td>23032</td>
<td>34108</td>
</tr>
<tr>
<td>2004/2005 Lockout</td>
<td>1561</td>
<td>4950</td>
<td>2301</td>
<td>863</td>
<td>20917</td>
<td>30592</td>
</tr>
<tr>
<td>2005/2006 Season</td>
<td>1577</td>
<td>6690</td>
<td>2201</td>
<td>395</td>
<td>22722</td>
<td>33585</td>
</tr>
<tr>
<td>2006/2007 Season</td>
<td>1524</td>
<td>5311</td>
<td>1330</td>
<td>226</td>
<td>30040</td>
<td>38431</td>
</tr>
<tr>
<td>Grand Total</td>
<td>10817</td>
<td>34431</td>
<td>20021</td>
<td>5221</td>
<td>163838</td>
<td>234328</td>
</tr>
</tbody>
</table>

Appendix Table 3 - Crime Counts of Hockey Season vs. Lockout Season

<table>
<thead>
<tr>
<th>Season</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hockey Seasons</td>
<td>9256</td>
<td>29481</td>
<td>17720</td>
<td>4358</td>
<td>142921</td>
<td>203736</td>
</tr>
<tr>
<td>Lockout Season</td>
<td>1561</td>
<td>4950</td>
<td>2301</td>
<td>863</td>
<td>20917</td>
<td>30592</td>
</tr>
</tbody>
</table>
### Appendix Table 4 – Crime Counts per Game Day Type

<table>
<thead>
<tr>
<th>Game Day</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>2094</td>
<td>6474</td>
<td>3986</td>
<td>973</td>
<td>31848</td>
<td>45375</td>
</tr>
<tr>
<td>Away</td>
<td>1993</td>
<td>6357</td>
<td>3791</td>
<td>933</td>
<td>31502</td>
<td>44576</td>
</tr>
<tr>
<td>Non-Game</td>
<td>5169</td>
<td>16650</td>
<td>9943</td>
<td>2452</td>
<td>79571</td>
<td>113785</td>
</tr>
</tbody>
</table>

### Appendix Table 5 – Average Crimes per Day by Season

#### Neighbourhood (Hockey Seasons)

<table>
<thead>
<tr>
<th>Neighbourhood (Hockey Seasons)</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Business District</td>
<td>2.58</td>
<td>7.1</td>
<td>6.06</td>
<td>0.84</td>
<td>40.09</td>
<td>56.67</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td>0.5</td>
<td>0.78</td>
<td>0.29</td>
<td>0.05</td>
<td>4.14</td>
<td>5.75</td>
</tr>
<tr>
<td>Downtown South</td>
<td>2.02</td>
<td>5.11</td>
<td>2.12</td>
<td>0.7</td>
<td>25.84</td>
<td>35.79</td>
</tr>
<tr>
<td>False Creek North</td>
<td>1.05</td>
<td>2.5</td>
<td>2.45</td>
<td>0.59</td>
<td>16.35</td>
<td>22.94</td>
</tr>
<tr>
<td>West End</td>
<td>1.57</td>
<td>9.07</td>
<td>3.85</td>
<td>1.45</td>
<td>32.69</td>
<td>48.63</td>
</tr>
</tbody>
</table>

#### Neighbourhood (Lockout Season)

<table>
<thead>
<tr>
<th>Neighbourhood (Lockout Season)</th>
<th>Assault</th>
<th>Disorder</th>
<th>TFA</th>
<th>VT</th>
<th>Other</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Business District</td>
<td>3.16</td>
<td>9.15</td>
<td>4.01</td>
<td>1.25</td>
<td>39.11</td>
<td>56.66</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td>0.25</td>
<td>0.46</td>
<td>0.11</td>
<td>0.05</td>
<td>2.74</td>
<td>3.6</td>
</tr>
<tr>
<td>Downtown South</td>
<td>1.95</td>
<td>3.49</td>
<td>1.93</td>
<td>0.83</td>
<td>21.31</td>
<td>29.51</td>
</tr>
<tr>
<td>False Creek North</td>
<td>0.85</td>
<td>1.55</td>
<td>1.76</td>
<td>0.53</td>
<td>11.7</td>
<td>16.39</td>
</tr>
<tr>
<td>West End</td>
<td>1.63</td>
<td>10.24</td>
<td>3.75</td>
<td>1.68</td>
<td>30.26</td>
<td>47.56</td>
</tr>
</tbody>
</table>
APPENDIX C: COMMUNITY PROFILES

Central Business District¹⁹

Land Use: Commercial, retail, residential
Residential Population: 2741
Dwellings: 1858
Liquor Primary: 42
Restaurants and Other²⁰: 95
Other Characteristics: this is one of the two bar districts in the Downtown

Central Waterfront

Land Use: Commercial, retail, some industrial
Residential Population: 971
Dwellings: unknown
Liquor Primary: 5
Restaurants and Other: 19
Other Characteristics:

False Creek North/Yaletown/Granville Slope/Citygate

Land Use: Residential, commercial, mixed use, social housing, parks, community
centres, schools
Residential Population: 14511
Dwellings: 8654

¹⁹ Unless otherwise stated, Data sources for these profiles is compiled from the City of Vancouver’s
Community WebPages found at http://vancouver.ca/community_profiles/downtown/index.htm and
Central Area Population Growth 2001 to 2006 available from:
²⁰ Other includes offsales, U-Brews etc.
Liquor Primary: 11
Restaurants and Other: 56
Other Characteristics: This area houses GM Place and BC Place

**Downtown South/Bridgehead**
Land Use: Commercial, residential, mixed use
Residential Population: 13739
Dwellings: 9819
Liquor Primary: 44
Restaurants and Other: 90
Other Characteristics: This is the other bar district in the Downtown core.

**West End/Triangle West/Bayshore Gardens/Coal Harbour**
Land Use: Residential, commercial, retail, office, mixed use ("choice use" can be used for residential, office, hotel, etc and is used in Triangle West)
Residential Population: 50862
Dwellings: 35487
Liquor Primary: 28
Restaurants and Other: 166
Other Characteristics: this area is also home to schools, community centres, beaches, access to Stanley Park.

**Downtown Eastside**
Land Use: residential, commercial, some industrial
Residential Population: 6120
Dwellings: 4983
Liquor Primary: 27
Restaurants and Other: 30
Other Characteristics: the DTES experiences social issues including drug addiction, dealing, prostitution, widespread HIV infections, and unemployment (City of Vancouver, 2008a, Online)
### APPENDIX D: CALLS FOR SERVICE DESCRIPTIONS

**Appendix Table 6 – Call Type Descriptions**

<table>
<thead>
<tr>
<th>Call Type</th>
<th>Description</th>
<th>Call Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assault</td>
<td>Assault</td>
<td>Disorder</td>
<td>Disorder</td>
</tr>
<tr>
<td>ASLT, PASLT, ASSA</td>
<td>Assault in Progress</td>
<td>ANNOY</td>
<td>Annoying Circumstances</td>
</tr>
<tr>
<td>ASSAI, ASLT1, PASLT1</td>
<td>Assault in Progress</td>
<td>PANNOY</td>
<td>Person Annoying</td>
</tr>
<tr>
<td>KNIFE, PKNIFE</td>
<td>Assault with a Weapon</td>
<td>PANHA</td>
<td>Panhandler</td>
</tr>
<tr>
<td>ASSAW</td>
<td>Assault with a Weapon</td>
<td>KPEACE, PKEEP</td>
<td>Keep the Peace</td>
</tr>
<tr>
<td>ASSAWI</td>
<td>Assault with a Weapon</td>
<td>PKEEP</td>
<td>Keep the Peace</td>
</tr>
<tr>
<td>WEAPI</td>
<td>Weapon in Progress</td>
<td>NEIGHD</td>
<td>Neighbour Dispute</td>
</tr>
<tr>
<td>STAB, PSTAB</td>
<td>Stabbing</td>
<td>ASSISG</td>
<td>Assist General Public</td>
</tr>
<tr>
<td>FIGHT, PFIGHT</td>
<td>FIGHT</td>
<td>MSCHF, PMISC</td>
<td>Mischief Report</td>
</tr>
<tr>
<td>GUN, PGUN</td>
<td>Person with a Gun</td>
<td>MISCH</td>
<td>Mischief</td>
</tr>
<tr>
<td></td>
<td>Vehicle Theft</td>
<td>MSCHF1, MISC1, MISCHI</td>
<td>Mischief in Progress</td>
</tr>
<tr>
<td>STAUTO</td>
<td>Stolen Auto Report</td>
<td>NOISE, PNOISE</td>
<td>Noise Complaint</td>
</tr>
<tr>
<td>PTHEF1</td>
<td>Theft in Progress</td>
<td>DISTN</td>
<td>Disturbance Noise</td>
</tr>
<tr>
<td>THEFVI</td>
<td>Theft Vehicle in Progress</td>
<td>DISTP</td>
<td>Disturbance Party</td>
</tr>
<tr>
<td>BAIT</td>
<td>Bait Car Activated</td>
<td>PROST</td>
<td>Prostitution Report</td>
</tr>
<tr>
<td>PVEHS</td>
<td>Stolen Auto</td>
<td>PPROST</td>
<td>Prostitution</td>
</tr>
<tr>
<td>THEFV</td>
<td>Theft Vehicle</td>
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<td>Annoying</td>
</tr>
<tr>
<td></td>
<td>Theft From Auto</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFAUTO, PTHEFA</td>
<td>Theft from Auto</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THEFTF</td>
<td>Theft from Vehicle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Adapted from Vancouver Police Department, 2007)