

**Residential Burglary in Guelph: Looking at the Physical and Social
Predictors of Break and Enters**

**by
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ABSTRACT

Residential Burglary in Guelph: Looking at the Physical and Social Predictors of Break and Enters

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The rate of residential break and enters in Canada has been declining according to official statistics, but has increased according to self reports of victims. Since the 1970s, considerable attention has been given to preventing break and enters by altering the physical environment. However, studies that assess the effects of physical design have produced mixed results. The data for this study were drawn from Guelph Police Service break and enter records, and property site assessments were performed using Google Earth and Street View. Drawing from rational choice and routine activities perspectives, physical and social features of burgled and non-burgled single detached dwellings were assessed to determine which features predicted break and enter victimization. Results suggest little empirical support for place-based crime prevention strategies such as Crime Prevention Through Environmental Design.

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Chapter One: Introduction

Most homeowners' only exposure to burglary occurs during the holiday season when the Christmas classic, *Home Alone*, is aired repeatedly on several cable channels. Viewers are introduced to the child protagonist, Kevin, who bravely defends his home against the half-wit antagonist burglars, Marv and Harry. Kevin booby traps the various entrances to his house using icy stairs, scalding hot door knobs and sharp Christmas ornaments; the burglars are haplessly overwhelmed by the child's wit. The film provides some genuine holiday laughs for the entire family at the expense of Marv and Harry's thwarted break and enter attempt. Break and enters in real life, however, are less entertaining and more devastating for the victims involved. Moreover, even though homeowners do not opt for icing their stairs to deter burglars, defence tactics aimed at preventing burglary is a burgeoning business shared by self-proclaimed experts, law enforcement, government officials and other interested parties. This study will begin to look at these defense tactics used by homeowners (either intentionally or unintentionally) and determine if they are effective in reducing victimization. Before this, however, a brief look at break and enter, its victims and its perpetrators will help introduce an offence many only know through the Hollywood lens.

Break and Enter in Canada

Break and enter is defined in two parts in the Criminal Code of Canada. The term *break* means "to break any part, internal or external, or to open anything that is used or intended to be used to close or to cover an internal or external opening" (Criminal Code of Canada, 1985). With respect to actual break and enters, internal and external covers are usually doors, windows, or gates to enclosed areas. For the term *enter*:

(a) person enters as soon as any part of his body or any part of an instrument that he uses is within any thing that is being entered; and a person shall be deemed to have broken and entered if he obtained entrance by a threat or an artifice or by collusion with a person within, or he entered without lawful justification or excuse, the proof of which lies on him, by a permanent or temporary opening (Criminal Code of Canada, 1985)

Although the United States and the United Kingdom defer to the legal term burglary, the essence of the crime is the same. According to the Criminal Code of Canada (1985), someone is guilty of a break and enter if they enter a place, intending to commit an indictable offence, commit an indictable offence, or they break out after committing an indictable offence. Someone who commits a residential break and enter may receive life imprisonment, while other dwellings or structures carry a maximum of ten years imprisonment. Despite the maximum sentence for residential break and enters, they still account for the majority of all break and enters committed in Canada. In 2002, for example, residential break and enters accounted for 59 percent of all break and enters in Canada (Fedorowycz, 2004); in 2009 they accounted for 60 percent (Dauvergne & Turner, 2010).

The 2009 General Social Survey revealed that self-reported rates of break and enter victimization actually increased 21 percent, from 2004 to 2009 (Perreault & Brennan, 2010). This apparent increase is at odds with police reported data, which suggests a continued decrease in break and enters since the 1990s (Dauvergne & Turner, 2010). According to police report data, break and enter rates peaked around 1991 with approximately 1600 incidents per 100,000 Canadians, and have since declined to just over 600 incidents per 100,000 Canadians as of 2009. Dauvergne & Turner (2010) suggest the decline is likely a function of households installing alarms and motion detectors as well as an increase in insurance deductibles. However, the discrepancy between self reported data and official police reported data might reflect victims'

willingness to report a break and enter. Perreault and Brennan (2010) show that just over half (54 percent) of all break and enters in Canada are actually reported to the police. They argue that there is a positive relationship between reporting a break and enter and the value of the property stolen from the dwelling. Generally, if the value of the stolen property exceeds \$1000, the crime is more likely to be reported (Perreault & Brennan, 2010). This evidence suggests that a reliance on official police data must be tempered with an understanding about what influences victims to come forward and report such incidents. While official statistics depict a continual decrease in break and enters, that decrease may be somewhat exaggerated. Break and enter rates may be controversial, but the emotional and psychological consequences for victims of break and enters are undeniable.

The victims

Although break and enters are classified as property offences under the Canadian Criminal Code, this should not detract from the serious consequences experienced by break and enter victims. Defrances and Titus (1993) argue that the psychological effects of break and enter on victims are comparable to those experienced by victims of assault or robbery insofar as victims feel personally violated and unsafe in their homes. Swaray (2007) indicates there is a significant interdependence between actual break and enters and fear of victimization. An individual's or family's house is also their home, and their own personal space within society. To the extent that a house, in essence, becomes a resident's place of refuge and protection, a break and enter undermines feelings of personal safety and security. Indeed, Wirtz and Harrell (1987) compared victim coping strategies across different types of crime and found that people who experience high levels of emotional distress used and checked their locks more often; they also

tended to install additional locks and bars in their home. Negative victim experiences are exactly what situational crime prevention measures attempt to minimize, by reducing opportunities for offenders to commit break and enters. Those measures are based on a large body of criminological theory which focuses on the crime, rather than the criminal.

The Offenders

Scholars have noted the challenge of obtaining accurate information about burglars' social characteristics. For example, Maguire and Bennett (1982) point out that obtaining offender characteristics for burglary is problematic because police clearance rates for this type of crime are usually between 10 to 30 percent. With these demonstrably low clearance rates, it is difficult to correlate burglar characteristics with the offense, because those who are caught may not represent the entire burglar population: perhaps those characteristics identified by researchers somehow lead those burglars to be caught, while different characteristics allow other burglars to continually evade police. The debate as to whether incarcerated burglars reflect the entire population of offenders persists, but the known characteristics are presented here solely for background information.

Researchers generally agree that burglars are often young offenders (Repetto, 1974; Pope, 1980; Maguire and Bennet, 1982; Mawby, 2001). Nee and Meenaghan's (2006) sample of burglars began their burglary careers when they were, on average, 13 years old. Maguire and Bennett (1982) argue that burglars are often responsible for multiple break and enter offences within a short period of time. More specifically, burglars often commit a rash or series of break and enters within a small geographical area or time frame, depending on offender mobility. Wright et al. (1995) interviewed 47 active burglars wherein the average number of break-ins for

the group was 148 and the median was 50. Burglars are thus likely to be repeat offenders who have been convicted of prior break and enter offences or other types of crimes. Burglars have often committed other types of crime in their lives prior to engaging in burglary (Maguire and Bennett, 1982). In sum, previous research shows criminals often begin to commit break and enters at an early age, break into multiple homes in short periods of time, and are involved with other types of crime.

Researchers largely agree that burglars are overwhelmingly males (Repetto, 1974; Brown & Bentley, 1993; Cromwell & Olson, 2011). Conversely, the findings about race are mixed; some studies identify most burglars as white (Pope, 1980; Brown & Bentley, 1993), while other research suggests non-white burglars are the predominant group (Repetto, 1974, Wright, Logie & Decker, 1995). These somewhat contradictory findings about race might reflect the demographics of the geographical areas where the burglary studies are conducted.

While the literature on race is mixed, a more commonly agreed upon characteristic is the background of the offenders. Maguire and Bennett (1982) note that most burglars tend to come from socially disadvantaged backgrounds, and most research concludes that burglars are motivated by a need for money to maintain their lifestyle, which may include partying and drug use (Repetto, 1974; Rengert & Wasilchick, 1985; Wright & Decker, 1994; Shover, 1996; Nee & Meenaghan, 2006; Cromwell & Olson, 2011). Rengert and Wasilchick's (2000) study revealed that some burglars even quit their legitimate jobs because burglary was more lucrative for sustaining their lifestyles.

Overall, based on known offenders, the image of a burglar is a younger male who comes from a socially disadvantaged background and has a known history of prior burglaries or other crimes. The burglar often commits more than one burglary and is motivated by money to sustain

his or her personal lifestyle which often includes drug and/or alcohol abuse. However, as is evident from the title of the current study, the offender is only one part of the crime equation; the physical environment where the crime occurs is the other piece that requires further examination.

Study Overview

The study seeks to answer three main research questions. First, what are the social and physical predictors of break and enters? This question is addressed by site assessments of burgled and non-burgled dwellings in Guelph, Ontario. Second, what do the results say about the efficacy of Crime Prevention Through Environmental Design? Based on the predictors of break and enters, I comment on the effectiveness of CPTED as a crime prevention strategy. Finally, how do the findings speak to CPTED's foundational theories of rational choice and routine activities? As an extension of the previous research question, I also discuss the utility of CPTED's two main theoretical foundations.

Chapter two provides the theoretical background related to place-based crime prevention strategies. Rational choice and routine activities theory are the major theoretical foundations that underlie such strategies. The two theories both assume a motivated offender, without actually discussing what motivates offenders to commit crimes. As such, these theories approach crime differently than other perspectives that use social, cultural or psychological factors to explain criminal behaviour. Several of the widely accepted crime prevention strategies are also presented, including their histories, recent developments and criticisms.

Chapter three reviews the literature on residential break and enters. The literature suggests that examining physical design and victimization is best done at the micro or property-level. Further research demonstrates causal linkages between design and crime are mediated

through perceptions and interpretations of individuals. Therefore, burglar perceptions of physical design features and dwelling victimization is discussed in order to better understand what deters these individuals from committing burglary.

Chapter four describes the methodology of the study. Justifications for and limitations with using Google Earth and Street View as site assessment tools are provided. The break and enter dataset from Guelph Police Service, the sample, variable definitions and analytic strategy are also presented. Chapter five describes the summary data for both the burgled and entire sample; this data identifies major trends or patterns. Inferential bivariate and multivariate analyses identify the physical and social variables that predict homeowners' chances of being victimized.

Chapter six and seven present a discussion and conclusion, respectively. Particular attention is devoted to the predictor variables that increased residents' chances of being burgled. The three research questions mentioned above are addressed directly, along with a critical discussion about effective place-based crime prevention. Limitations and future research are also presented for reader consideration. Ultimately, I anticipate this research will provide a better understanding about what design elements, or lackthereof, precipitate burglaries and explain why those elements are conducive to break and enters. Moreover, I hope that this work will encourage others to critically assess place-based crime prevention strategies, and explore what theoretical and/or practical improvements can be made to ensure this mode of crime prevention is effective.

Chapter Two: Theoretical Approach

There are two general approaches to the study of break and enters. The first focuses on the criminal's dispositions and/or behaviours and has traditionally been the focus of criminological research that emphasizes the role of psychological and/or social forces when explaining why offenders turn to crime. The second approach shifts its focus from the offender to the crime event. This approach recognizes the social and physical environment where the crime takes place while seeking to control or influence the event by altering temporal, spatial/environmental and social elements related to that crime.

However, Nee and Taylor (1988) argue that while social forces are relevant to the explanation of criminality, the inconsistent relationships between the two makes these explanations of little practical value. Moreover, they argue that even if such causal links could be substantiated, their usefulness for crime control is unknown because causality does not necessarily facilitate adequate remedies to the problem (Nee & Taylor, 1988). Clarke argues that "we do not know how to bring about some of the needed social changes, such as making parents love their children more. As for better welfare and education, these may be seen as desirable but often as demanding resources that society cannot afford" (Clarke, 1995, p.14). Nee and Taylor, and Clarke are right to point out that even if social causes of crime are discovered, the practicality of dealing with such issues is difficult due to personnel, financial and resource constraints amongst many social programs, law enforcement and governments. Clarke (1995) also acknowledges that other countries have improved such social programs only to see a subsequent increase in crime. This suggests that the traditional focus on the criminal is not always beneficial for understanding and controlling crime. This realization has prompted researchers and public officials alike to examine crime as an event.

Understanding crime as a culmination of factors in time and space becomes the focal point, not the social forces that drive an offender to engage in crime. This type of thinking borrows from classical criminology, which has become popular once again. Classical criminology argues that humans exercise their own free will within the confines of a collective acceptance of societal laws and rules. Additionally, the classical perspective assumes that individuals are hedonistic and that they will seek to maximize benefits while minimizing pain (Brantingham & Brantingham, 1984). The classical perspective advocates for punishment and deterrence as its method of legal control over individual behaviours. Assuming that individuals will behave in a manner that minimizes pain, the threat of legal sanction or punishment for an illegal act is sufficient to deter the individual from committing a crime. Several theories and applications have developed from these classical assumptions about human behaviour to examine crime as an event.

Routine Activities Theory

Cohen and Felson developed routine activities theory to explain rising crime rates in the United States during the 1960s and 1970s. They were perplexed when the National Commission on the Causes and Prevention of Violence revealed that robbery, aggravated assault, homicide, rape and burglary had all increased while quality of life seemed to be improving; high school completion rates and median household income levels had increased, while unemployment and poverty rates were declining (Cohen & Felson, 1979). These statistics flew in the face of many criminological theories that hypothesized an inverse relationship between adverse social conditions and crime. Cohen and Felson sought a new explanation for this paradoxical relationship by examining crime as an event. In particular, they examined predatory crimes

where the criminal intentionally targets a person and/ or their property (Cohen & Felson, 1979). Their explanation examined the convergence of legitimate activities carried out by citizens and how those provided opportunities for crime throughout time and space. From this, Cohen and Felson (1979) inferred that the rise in crime rates was due to broad changes to legitimate social activities carried out by citizens during the 1960s and 1970s. These broad social changes are what Cohen and Felson (1979) called *routine activities* - a continuous or prevalent activity for a group or individual that satisfies a collective or individualistic need (Cohen and Felson, 1979). Activities such as school, work, leisure, food consumption and living under shelter are examples of continuous or significant activities that people perform on a daily basis to meet their needs. Cohen and Felson (1979) argued there were major changes in routine activities after World War II. Specifically, to explain burglary, Cohen and Felson argued there was a surplus of durable and movable consumer goods purchased and circulated during this time, while at the same time, the proportion of females in the workforce and education system increased. What they inferred was that these legitimate activities left homes unoccupied and valuable goods unguarded for extended periods of time. From their research, Cohen and Felson (1979) argue that crime is a function of (1) a motivated offender, (2) a suitable target, and (3) the absence of capable guardianship.

Past criminological theories were largely preoccupied with criminal motivation or what drove individuals to become criminals. These theories, which viewed external forces, such as social or economic forces, as motivating individuals to commit criminal acts, dominated the early decades of the twentieth century (Brantingham & Brantingham, 1984). According to different theorists in sociology and criminology, criminal inclinations could stem from learning criminal tendencies and skills from others (Sutherland, 1947), from social labelling (Becker, 1963; Lemert, 1951), or from unequal distributions of opportunity in society (Merton, 1938);

however, whatever the source of motivation, these criminological theories falsely equate criminality with crime, instead of realizing that criminality is one feature that leads into the criminal event (Brantingham & Brantingham, 1993). Essentially, theorists have been satisfied with criminal motivation as an adequate explanation for crime. However, crime must take place within the physical environment, and as such, the physical environment, including temporal and spatial elements, must be included in the crime equation. Cohen and Felson (1979) realize the importance of such criminological research, but because of their focus on the criminal event itself, criminal motivation is assumed in routine activities theory. By doing this, Cohen and Felson (1979) strategically avoid the theoretical debate about criminal motivation; one in which Brantingham and Brantingham (1984) suggest there is no consensus. Therefore, routine activities theory simply acknowledges that any one of those explanations or a combination of motivations would fulfill their motivated offender criterion.

The second element is a suitable target -- anything or anyone an offender is likely to take or attack (Clarke & Felson, 1993). Routine activities theory considers victimization a simple convergence of people or objects in time and space. Some argue that a suitable target is often used too narrowly, by referring to material objects and their value or portability (Hough 1987; Miethe & Meier, 1994). Finkelhor and Asdigian (1996) argue that while a suitable target is well suited to describe property offences, it becomes more complex when determining what is suitable or desired by a sexual offender, for example. This shows different types of criminals vary in what they consider *suitable* and individual perceptions or evaluations of potential targets depends on more than monetary value or transportability. While this is an important distinction, this study's focus on property crime means that most burglars would select items that would be moveable and sellable.

The third element is the absence of capable guardianship. In most cases, capable guardianship does not refer to a police officer or guard. Clarke and Felson (1993) argue this is a conscious attempt to distance themselves from other criminological discourse, which relies heavily on the criminal justice system to prevent crime. Instead, routine activities theory engages normal citizens such as neighbours, friends, relatives and bystanders arguing they are capable guardians (Clarke & Felson, 1993). Guardianship can even be extended to include non-human methods of guardianship, such as security cameras or windows. Spano and Freilich (2009) highlight that the empirical findings regarding guardianship are mixed. It could be the case that guardianship is applied to crimes which may not fulfil the standard definition of predatory crime. For example, guardianship has been used to explain youth victimization. Finkelhor and Asdigian (1996), for example, argue that youths are often victimized because of their tendency to engage in risky behaviour, such as staying out late and/or partying. These activities often pull youths away from their household and parental supervision, thereby reducing the presence of effective guardianship. While guardianship explains youth-on-youth stranger victimization, Finkelhor and Dziuba-Leatherman (1994) point out it does not account for the victimization of youth by acquaintances or family members. Paradoxically, those considered effective guardians can also be the offender. Routine activities theory has been extended beyond its initial macro-level focus in order to explain the micro or individual-dynamics of victimization (Coupe & Blake, 2006), while also linking both the micro and macro levels together (Sampson & Wooldredge, 1987). Spano and Freilich (2009) examined 219 studies from 1995 to 2005; all of which evaluated routine activities theory. In addition to their general findings (which demonstrate support for routine activities), they argue that empirical support is more pronounced for studies that examine adolescent or college/university student populations. Despite empirical support for routine

activities, Spano and Freilich (2009) argue there is still considerable overlap between the theory's key concepts. For example,

Adolescent participation in deviant lifestyles is a risk factor for victimization, which represents lower guardianship, higher target attractiveness and increased exposure to potential offenders. Finally, level of attachment to the family, which is a protective factor against victimization, can be characterized as increased guardianship, lower target attractiveness, and lower levels of exposure to potential offenders (Spano & Freilich, 2009, p.312).

This demonstrates the blurring of key concepts, making it difficult to assess which concepts might have the most significant effect in deterring or precipitating crime. Researchers should attempt to operationalize routine activities concepts accurately in order to lessen this overlap. Despite conceptual flaws, routine activities theory shows considerable explanatory value, especially when coupled with an explanation about criminal decision making.

The Rational Choice Perspective

Like Cohen and Felson, Clarke and Cornish (1985) became disillusioned with traditional, positivist criminological theory. They viewed humans as hedonistic and self-interested. With that in mind, rational choice is not actually intended to be a theory (Clarke & Cornish, 1985), even though it is often referred to as such (Haan & Vos, 2003; Farrell, 2010). Clarke and Cornish's (1986) perspective is, rather, an organizing framework capable of incorporating other criminological theories and thus capable of producing a comprehensive explanation of crime. In addition, the perspective is a framework for understanding both individual decisions to start, continue and desist from crime, but also the decision-making process of an offender during a specific criminal event. In this sense, rational choice is an individual or micro level theory that is suited equally for explaining the life-course of a criminal as well as the particular crimes he/she chooses to commit, no matter the type of crime.

Clarke and Cornish (1986) suggest the rational choice perspective has three key components: (1) the rational offender, (2) a crime-specific focus, and (3) the development of different decision-making models for criminal involvement and also criminal events. The term “rational” offender emphasizes information processing, evaluating outcomes and alternatives, and thinking strategically. However, rationality is often misinterpreted as making good or correct decisions. Rationality refers to the means used to reach an individually desired outcome. In essence, a potential offender processes relevant information to make a decision regarding the costs and benefits of a particular crime, and consequently acts according to his/her evaluation. Furthermore, unlike Becker’s (1968) economic explanation of ideal decision-making, Clarke and Cornish (1986) acknowledge an offender’s decision-making is constrained by limitations of available knowledge and time, and as such, decisions are made with limited or bounded rationality. However limited and rudimentary the decision-making process of an offender may be, Clarke and Cornish (1985) argue that there is still a measure of rationality. Snook et al. (2010) argue that recent research favours the limited or bounded rationality model, highlight the importance of offenders’ reliance on cognitive processing shortcuts, or heuristics, which are cognitive ‘rules of thumb’. They asked forty male prisoners to look at and evaluate pictures of randomly selected houses in terms of their vulnerability to being burglarized. They discovered that prisoners used what Dhami and Ayton (2001) described as the matching heuristic strategy. Essentially, the offender automatically considers a residence occupied and actively searches for cues that would suggest otherwise. Offenders differ in terms of what environmental cues influence their decision to burglarize a house. Decision-making strategies, such as the matching heuristic, demonstrate that offenders actively process and evaluate information (constrained by limited knowledge) in order to reach a decision.

The second element of a crime-specific focus borrows from Clarke's (1980) earlier work on situational crime prevention (discussed later). Clarke and Cornish (1986) argue that different forms of crime (including variation within types of crime) require an offender to evaluate his/her immediate situation differently in terms of the physical or social cues that signal to the offender whether or not he/she should commit the crime. For example, an offender who commits a street robbery will plan and make decisions that differ from an offender who commits a commercial robbery. A street robber is likely to consider their ideal victim characteristics, the location to rob and an exit strategy. A commercial robber is likely to consider a possible alarm system, their method of entry and exit and possible resistance by the employees, for example. While there is some overlap in the offenders' decisions, there are marked differences. From a rational choice perspective, legal categories of crime are not specific enough to develop effective crime prevention measures because different situations or contexts can produce different behaviours among the same category of criminals, such as burglars.

The rational choice perspective also attempts to explain how offenders make decisions to engage and desist from his/her criminal lifestyle or career. Clarke and Cornish (1986) developed schematic models to highlight sequential steps in the decision making process for engaging in and desisting from the criminal lifestyle. However, Clarke and Cornish (1985) suggest there are always exceptions to their models, meaning not all decision-making will follow their models. Ultimately, rational choice, as described by Clarke and Cornish (1986), is a perspective that deals "not just with crime but also criminality, and not merely with the form and content of decision-making itself but also with the historical and contemporaneous background to decisions... there is a need for integration of theory, and [this] perspective represents one such attempt" (Clarke & Cornish, 1986, p.10-11). Despite this claim, Clarke and Cornish do not

explain sources of criminality. It is possible they consider their models, which examine involvement and desistance from the criminal lifestyle, as dealing with criminality; however, this does not address the causes of criminality as effectively as other criminological theories. If nothing else, this is merely an attempt by Clarke and Cornish to divert criticism from proponents of dispositional theories of criminality.

Despite not dealing with the causes of criminality, rational choice proponents argue that the perspective is easily applied to crime prevention initiatives and policies. Cullen et al., (2002) argue that rehabilitation requires the altering of personal values which is costly and time consuming, whereas increasing costs and minimizing benefits for a potential offender means altering the immediate, physical environment. From a public policy perspective, managing potential crime occurrences in time and space is more cost-effective and efficient than attempting to alter personal value systems and beliefs. As is evident below, the rational choice perspective has been generally supported by empirical research.

Rational Choice Applications

The rational choice perspective has been applied to many property crimes, including but not limited to shoplifting (Carroll & Weaver, 1986; Cromwell et al., 2010), burglary (Walsh, 1986, Wright & Logie, 1988; Wright, Logie & Decker, 1995; Nee & Meenaghan, 2006, Cromwell & Olson, 2011, Snook et al., 2010), auto-theft (Copes & Cherbonneau, 2006) and robbery (Conklin, 1972; Feeney, 1986; Wright & Decker, 1997; Desroches, 2002; Bernasco & Block, 2009). The rational choice perspective explains economic/acquisitive crimes very well. However, as Hayward (2007) argues, the perspective is unable to adequately explain expressive crimes or crimes where material gain is not the goal. Expressive crimes, according to Hayward

(2007), include rape, child molestation and hedonistic drug use, for example. This debate of whether rational choice is capable of explaining all crime stems largely from how researchers choose to conceptualize what *rational* means. Those who consider human beings as rational versus emotional, as opposed to those who consider rational thinking as information processing will reach different conclusions about how effective the rational choice perspective is when explaining different forms of crime. Studies of rational choice generally show the framework is effective for explaining property crimes. It has also been used with some success to describe corporate crime (Simpson, Piquero & Paternoster, 2002) and organized crime (Cornish & Clarke, 2002). It is apparent from such studies that the rational choice perspective can be used effectively to explain different types of criminal behaviour above and beyond the property crimes which tend to be its specialty.

Rational Choice and Routine Activities Theory

While the focus is different in each, there are some commonalities that bind routine activities and rational choice together. First, both theories assume a criminal who is receptive to opportunities and/or temptations to commit crime. Moreover, both assume everyone has the propensity to become a criminal, and that individuals can shift in and out of criminal activity (Clarke & Felson, 1993). Both theories agree that crime is a rational action, capable of being committed by all, not just those biologically or structurally compelled into a life of criminality. Similarly, rational choice and routine activity theory view human behaviour as purposive. Therefore, crime is not the result of criminal traits or predispositions, but an offender's crude evaluation of the costs and benefits for committing a crime at a certain time and place (Clarke & Felson, 1993). Finally, both theories recognize the criminal event as the focal point for research

and analysis, firmly differentiating this approach from other criminological theories. These perspectives serve to compliment the traditional, dispositional theories of criminality, by providing another major area of research – the physical setting where the crimes occur.

The Environment and Crime Prevention

While rational choice and routine activities were in their infancy, an emphasis on the environment emerged. During the 1970s and the 1980s an intellectual shift towards crime as an event was evident in both the United States and Britain. This body of literature assumed the physical environment's manipulation could effectively reduce opportunities for crime. While Newman (1972) and Jeffrey (1971) explored this emerging field in the United States, Clarke (1980) was developing his version in the UK. Even though these approaches were developed largely in isolation, there was and remains considerable overlap. Schneider and Kitchen (2007) note that while Newman is often credited with establishing modern Crime Prevention Through Environmental Design (CPTED), its genesis actually belongs to Jeffrey.

Crime Prevention Through Environmental Design

Jeffrey (1971) credits Shaw and McKay (1942) for pursuing human ecology in criminology. However, Jeffrey notes that Shaw and McKay made the mistake of examining the social environment and individual offenders, rather than focus on the physical environment and characteristics of the offense. Alternatively, Jeffrey also denounces the purely environmental approach to crime. He states that “we now have a breed of ecologists who are taking a careful look at the physical environment and crime... However, these new ecologists are pure environmentalists; they ignore the basic genetic and psychological differences in people who are

involved in response patterns” (Jeffrey, 1971, p.208). Whereas Newman (1972) was preoccupied largely with the physical setting, Jeffrey’s approach was more comprehensive. Jeffrey acknowledged the complex interdependence of the individual and the environment, and how that interaction is mediated through cognitive processing and individual perceptions (Jeffrey, 1971). Therefore, crime is best understood at the micro-level, because the micro-level approach makes examining the individual-environment relationship possible.

CPTED encourages the use of hard architecture, namely doors, locks, security systems and other physical adaptations that can be amended to a particular environment in an effort to reduce crime. However, Jeffrey (1971) reminds us that his method of crime prevention extends well beyond this, arguing that hard architecture is dehumanizing and, if implemented on its own, is actually counterintuitive to crime prevention. An individual who chooses to fortify his or her residence with locks and barriers effectively secludes himself or herself from the rest of the world. Secluding one’s self reduces opportunities to develop social connections and foster a sense of community among local residents – another means to prevent crime. Therefore, Jeffrey (1971) argues that the physical manipulation of the environment is not a sufficient means to prevent crime.

Instead, Jeffrey argues that examining how the individual organism and the environment *interact* through behaviour is the most effective means for crime prevention. Similar to Clarke and Cornish, Jeffrey also assumes that human behaviour is based on the pursuit of pleasure and the avoidance of pain (Jeffrey, 1971). Therefore, by consciously keeping the behaviours of the organism in the foreground, alterations to the physical environment will ensure better crime prevention. While Jeffrey’s ideas were broadly focused on multiple systems of prevention, it received little recognition in the form of government funding or program development (Jeffrey,

1971; Schneider and Kitchen 2007). Instead, Newman's 1972 book titled *Defensible Space* was narrower and garnered more favourable support from government institutions.

Defensible Space

Whereas Jeffery's ideas of crime prevention encompassed individual behaviour and psychology, Newman – perhaps because he was an architect – focused exclusively on the physical setting. While Jeffrey (1971) does mention hard architecture, Newman makes that element the focal point of his approach. Newman's fundamental argument is that the physical setting can be designed to increase residents' sense of control and ownership over the space (Newman, 1972). Defensible space is essentially about “shaping, creating, preserving and maintaining proprietary control over one's territory” (Schneider & Kitchen, 2007). However, critics argue that by negating the social and psychological processes that accompany physical settings, Newman's theory is overly simplistic (Mayhew, 1979; Reynold & Elffers, 2009). Newman contributed to many crime prevention measures used today, but effective prevention must encompass more than physical alterations of the environment.

Newman, like Cohen and Felson (1979), sought to understand the rise in crime rates in urban areas. Rather than tackling the problem, he argued that citizens evaded crime by retreating into their dwellings. However, Newman (1972) cautioned that evasion has unforeseen consequences. The first consequence is citizens' indifference and ignorance of the crime problem, which actually allows crime to continue on the streets because no one cares once they have retreated. Secondly, residents' shift the onus of security onto formal outlets such as security guards and police (Newman, 1972). Newman argues that urban buildings allow for this evasion to happen with relative ease. The security guard at the front door and the concrete wall erected

around the property serve to protect the citizen from crime, but adversely affect what is outside the wall on the street (Newman, 1972). Like Jeffrey, Newman realizes that physical alterations can have adverse affects on crime if not properly designed. Therefore, Newman advocates for physical alterations that encourage citizens to assume responsibility for their territory, rather than citizens retracting entirely.

Newman (1972) claims that high-rise apartment buildings are major contributors to crime. Those who developed these structures did so in an effort to reduce property costs, with little regard for safe living spaces. Newman found a positive correlation between building height and crime; hypothesizing that larger buildings foster a sense of anonymity, isolation, irresponsibility and a lack of identity (Newman, 1972). He proposed that the four elements of (1) territoriality, (2) natural surveillance, (3) image, and (4) milieu were essential to creating a secure environment, and that these elements are often interrelated (Poyner, 1983). Reynold and Elffers (2009) argue that this overlap and conceptual ambiguity amongst the four elements has led to different conclusions about the effectiveness of defensible space (see Booth, 1981; Perkins et al., 1992).

Territoriality refers to the zoning of shared space around residential buildings to establish a sense of ownership among residents (Poyner, 1983). This includes developing real or symbolic barriers which interrupt people's movement. Real barriers include fences, locked gates, doors and walls, for example. Symbolic barriers include gateways, light standards, small sets of stairs, gardens, plants and texture changes to walking surfaces (Newman, 1972). Real and symbolic barriers convey a sense of ownership over space and direct undesirable people away. The only difference is that, for a potential offender, real barriers require more physical effort to overcome. Despite Newman's territorial assumptions, Merry (1981) argues that physical design does not

necessarily lead to residents assuming ownership over their property; meaning that physical design is only part of the solution. Newman (1977) addressed this shortcoming by examining social variables that encourage territoriality, adding that social characteristics are more important than design features for predicting crime. At a practical level, Reynold and Elffers (2009) argue that Newman's conceptualization of territoriality refers to an unspecified level of space, meaning that theoretically, territoriality can encompass individual properties, streets, or collective neighbourhoods. Unfortunately, how to apply territoriality to various levels of space remains unclear.

Natural surveillance refers to "the ability to observe the public areas of one's residential environment and to feel continually that one is under observation by other residents while on the grounds" (Newman, 1972, p.78). This involves improving sight-lines by installing strategically placed windows, making obstacles transparent, and reducing unnecessary foliage, for example. The assumption with natural surveillance is it simultaneously allows communities to watch over each other, but also identify potential outsiders and take action (Newman, 1972). Implicit in Newman's work is an assumption that there is a clear distinction between residents and outsiders. As Reynald and Elffers (2009) point out, Newman considers outsiders potential offenders, rather than possible guardians. Jacobs (1961) on the other hand, considers outsiders as potential guardians and she argues that their presence will provide additional natural surveillance. Therefore, unlike Newman who recommended residential buildings small enough for residents to maintain some form of informal control, Jacobs advocates combining residential, commercial and institutional properties in close proximity to ensure a steady stream of outsiders capable of providing natural surveillance. Interestingly, studies empirically support both

Newman's view that outsiders can be potential offenders (Beavon et al., 1994) and Jacobs' account of outsiders providing natural surveillance (Hillier and Shu, 2000).

Image refers to the property and/or building's aesthetic appeal. Newman (1972) criticizes the United States government for making low-income projects that were unappealing and dull, arguing it was a deliberate attempt to maintain symbolic class divisions. Decreasing crime in a particular area, Newman argues, requires a visual 'face lift' to convey a sense of pride and to encourage participation among residents.¹

Milieu refers to the property's location within the larger social environment, and how the positioning of properties close to what Newman considers safe areas, such as two-way streets or institutional areas, can reduce crime (Poyner, 1983). Newman (1972) argues that strategically placed properties benefit from natural surveillance, which helps residents feel safe and exercise more territorial control.

Modern CPTED principles are based largely on the work of Oscar Newman. His argument that the physical environment can shape and influence residents to take ownership over their property and local area is a focal point that still underpins many of the contemporary place-based crime prevention strategies

Situational Crime Prevention

While the interest in reducing crime via the physical environment was well underway in the United States, Clarke (1980) developed his own version called "situational crime prevention". Its three main elements include:

Situational prevention comprises opportunity-reducing measures that (1) are directed at highly specific forms of crime, (2) involve the management, design or

¹ This particular concept predated broken windows theory (see Wilson & Kelling, 1982).

manipulation of the immediate environment in as systematic and permanent way as possible, (3) make crime more difficult and risky, or less rewarding and excusable as judged by a wide range of offenders (Clarke, 1995).

First, Clarke (1995) acknowledges crime prevention measures will not deter all crimes in a particular place. Instead, they must be geared towards variations even within types of crime such as break and enters, because there are considerable differences in the methods used and the property taken. Differences even exist from property to property, meaning crime prevention measures must be highly specific to be effective. Second, these measures can be employed either socially or physically. In addition to the physical environment, activities, procedures, habits or other behavioural processes that provide opportunities for crime in a particular location can be manipulated. Third, Clarke connects situational crime prevention to his rational choice perspective with his mention of increasing perceived costs for committing a crime. Moreover, he explicitly acknowledges both routine activities theory and rational choice as the theoretical foundation for situational crime prevention (Clarke, 1995). He refrains from specifying the types of crime situation crime prevention measures are geared towards, however, because both property and violent crime depend on a situational environment.

Clarke (1995) highlights that for situational crime prevention, the onus for prevention moves from the justice system into the semi-private and private realms of individual homes and businesses. Therefore, the activities and actions of home and business owners will determine partially how many criminal opportunities exist. This view of crime prevention is more encouraging than calls for reform to the justice system because, theoretically, prevention involves simple manipulations to the environment.

CPTED moving forward

While multiple variations of environmental crime prevention existed independently during the 1970s and 1980s, in recent years they generally utilize or refer to concepts developed by CPTED, at least in North America. The current state of CPTED includes conceptual elements from Jeffrey, but most stem from Newman and Clarke (Schneider & Kitchen, 2007). Most modern incarnations of CPTED, however, espouse different core design principles. For example, Schneider and Kitchen (2007) argue there are four CPTED principles, including: natural surveillance, access control, territorial reinforcement and proper land use. According to Moffat (1983) and Cozens et al., (2005) CPTED has six principles which include surveillance, access control, territoriality, target hardening, image/maintenance and activity support. While both variations show considerable overlap, the latter includes two new elements. Crowe (2000) developed a simplistic model of CPTED which includes just three elements; natural access control, natural surveillance and territorial reinforcement. Crowe (2000) places more emphasis on natural design principles rather than promoting organized and mechanical forms of access control and surveillance. Crowe (2000) advocates for natural prevention techniques, because he argues that those promote more action from local residents to take ownership for their spaces, rather than place the onus on a private security company or CCTV system. For him, CPTED still relies on intrusive measures such as guards and cameras, but those measures are considered secondary and only sought if natural prevention techniques are not desirable or possible (Crowe, 2000).

CPTED has evolved from Newman's (1972) reliance on target hardening to more subtle forms of territorial influence, such as shrubbery, textured surfaces and other less invasive methods which influence individuals to refrain from committing crime in a given area. Today,

depending on the author, the number of CPTED design principles varies, but they are often interrelated and reinforce one another. Studies seeking to evaluate the effectiveness of this prevention strategy have produced mixed results. These results have generated multiple criticisms leveled at CPTED.

CPTED: Criticisms and Shortcomings

Eck (2002) conducted a comprehensive study of 109 interventions in North America, Great Britain, Continental Europe and Australia to evaluate what works in CPTED. He differentiated places into four different categories (residential, retail places, transportation and public spaces), and within several of those, subcategories were defined. For Eck (2002), a place-focused prevention strategy worked if it had two or more positive studies that were able to test for crime both pre- and post-intervention, and if it had a comparable control condition (Farrington et al., 2002). Additionally, to be considered effective, studies had to demonstrate the effects were significant (Eck, 2002).

Eck (2002) identified two preventative measures that were effective. First, in residential areas, nuisance abatement (i.e. bylaw enforcement) was effective, and second, in public spaces, lighting was effective. Prevention strategies such as CCTV, target hardening, restricting movement and removing targets had unknown effects. Many of the prevention techniques could not be adequately evaluated because the studies themselves were methodically flawed. Eck (2002) suggests improving evaluation procedures of study sites, improving scientific method and expanding existing theories in order to better understand how CPTED works.

The most common criticism of CPTED practices is the possibility of crime displacement. Since CPTED approaches assume a motivated offender, critics suggest situational deterrence at

one location will only cause motivated offenders to try another place, time, target, tactic or offense. This type of thinking brings us back to the divergent perspectives in criminology. Those who argue that displacement is inevitable are generally those who believe in dispositional theories of criminality, wherein they believe criminals will persist with other crimes. Eck (1993) reviewed thirty-three studies where place-based prevention strategies were implemented and noted that 91 percent reported little or no displacement of crime, whereas only 9 percent reported a substantial amount of displacement. Other studies have discovered that displacement is often negligible or minor relative to the social gains made by the initial CPTED intervention (Barr & Pease, 1990, Hesselning, 1994). Guerette and Bowers (2009) are critical of the findings from such studies because the conclusions are based on a small number of studies, thereby making generalizations problematic. To overcome this problem, Guerette and Bowers (2009) tested the notion of displacement but also 'diffusion of benefit' on 102 evaluations of CPTED interventions. The term 'diffusion of benefit' refers to the possibility that a CPTED intervention can have positive effects that extend beyond the target area, making other local areas less vulnerable to crime. It can also be referred to as the 'bonus effect', the 'halo effect', the 'freerider effect', and the 'multiplier effect' (Guerette & Bowers, 2009). They concluded that displacement and diffusion were observed in 26 and 27 percent of the evaluations, respectively, but that also 84 percent of the interventions showed crime reductions at the intended site. The main shortcoming with their meta-analysis is the studies they examined did not intend to measure displacement effects, meaning the research design of each study they examined may not be a valid indication of crime displacement at all. CPTED as a crime prevention approach seems effective on a theoretical level but empirical research demonstrates that methodological inconsistencies and ambiguous design principles make it difficult to know what works.

Chapter Three: Literature Review

Residential Break and Enters

Break and enter, or burglary, is the type of crime often associated with CPTED evaluations. Studies like Nee and Meenaghan (2003) support the rational choice perspective and its suggestion that criminals exhibit a level of bounded rationality. Their study, which aimed to uncover the decision-making differences between novice and expert level burglars, concluded that all burglars make decisions based on situational cues, but experts do it in a rather automatic fashion insofar as their decisions are quick and seemingly unconscious (Nee & Meenaghan, 2006). Research which examines the decision making strategies of burglars demonstrates their decisions generally follow the model prescribed by the rational choice perspective. Therefore, it is theoretically feasible to study CPTED measures in relation to residential break and enters.

Residential breaking and entering has been examined at both micro and macro levels of analysis. A study in London, Ontario by Malczeski and Poetz (2005) examined the aggregate relationship between neighbourhood socioeconomic status and rates of breaking and entering. They discovered certain areas in their study with high and low socioeconomic statuses, experienced higher break and enters relative to other areas of the city (Malczeski & Poetz, 2005). They provide separate explanations as to why both ends of the socioeconomic scale had higher break and enter rates. The abundance of attractive dwellings, they argue, is the main reason for the high rates of burglary in high-income areas. For low-income areas, opportunity is the most influential factor, meaning there are more motivated offenders and a lack of capable guardianship in these areas (Malczeski & Poetz, 2005). While aggregate studies can provide some generalizations, their level of specificity is broader than Clarke and Cornish (1986) suggest is needed to fully understand different crimes. Unlike neighbourhood level studies, property level

studies are better suited to assess the physical environment and its influence on break and enter. Hirschfield et al. (2010) argue that research on burglary and CPTED strategies is rarely done at the property level; thus they conducted a longitudinal analysis on properties that were target-hardened and observed whether or not they were subsequently burgled. The results suggest target-hardening strategies do not always deter burglaries. Whereas neighbourhood level studies can provide general assertions about CPTED strategies, Hirschfield et al. (2010) highlight the importance of property level data to identify some discrepancies with target-hardening strategies.

Micro-macro studies predicting burglary outcomes attempt to bridge the gap between individual level and neighbourhood level factors. Defrances and Titus (1993) assessed which micro (e.g. signs of occupancy or safety precautions) and macro level factors (e.g. neighbourhood disorganization or neighbourhood watch) predicted either attempted or completed break and enters. At the macro level, neighbourhood disorganization was significantly correlated with completed break and enters, while occupancy or guardianship was significantly correlated with attempted break and enters. These findings are tempered by their weak methodology. Defrances and Titus (1993) grouped variables into dichotomous categories, hindering the possibility of determining which CPTED measures affect burglaries at the micro level. Wilcox et al. (2007) argue that micro-macro studies of burglary suffer from poor conceptualization of independent variables, indicating that this is a common problem with micro-macro studies of burglary. Nevertheless, some burglary research has contributed to a more comprehensive view of burglary by examining how the physical environment is mediated through individual perceptions.

Several studies realized the physical environment is one piece of a crime, but that how potential offenders interpret the physical environment is another. Individuals all perceive and

interpret environmental stimuli different, with some attending more carefully to certain characteristics than others. This being the case, assuming that situational prevention measures have a universal affect on all potential offenders is a mistake. On a more practical level, it is crucial the perceptions of those implementing crime prevention strategies match with those held by offenders. This is a difficult task, but research should at least attempt to reconcile the perceptual gap between criminals and non-criminals. If this gap is not addressed, the interventions might not be effective. Brown and Bentley (1993) conducted a study with 72 convicted burglars to determine what environmental cues are most important for assessing house vulnerability. Participants viewed 10 photos of burglarized and non-burglarized houses (five photos of each) and indicated whether they thought the house had been burglarized. In addition, participants provided subjective ratings of house vulnerability based on occupancy, difficulty of entry, possible neighbor reactions, territoriality and potential profit from the stolen property. First, they discovered burglars lacked the ability to correctly identify a house as having been burglarized (Brown & Bentley, 1993). Similar to MacDonald and Gifford (1989), house occupancy was generally perceived as irrelevant for assessing vulnerability. Brown and Bentley (1993) highlight that there were two subgroups of burglars that emerged from their study. For the first group (42 percent), participants identified potential property as the most influential factor related to house vulnerability. For the second group (58 percent), higher subjective ratings for neighbour reactivity, difficulty of entry and territoriality were associated with lower vulnerability. It appears that even burglars differ in which stimuli they consider to be most important in determining whether a house is vulnerable. Ham-Rowbottom, Gifford and Shaw (1999) examined the problem of perception to determine if police, residents and burglars all perceive certain environmental cues similarly. Fifty single unit dwelling photos were assessed by

police officers in terms of their actual barriers, symbolic barriers, traces of occupancy, occupant surveillability, road surveillability and house value. Their findings suggest that among police, only actual barriers, traces of occupancy and road surveillability are thought to reduce a property's chance of victimization. Moreover, they concluded that police and residents perceive similar cues as reducing victimization, but that those perceptions differ from actual burglars (Haw-Rowbottom, Gifford & Shaw, 1999). Wright, Logie and Decker (1995) found similar results where burglars focused on different environmental cues than non-offenders when selecting target houses, but also that burglars showed better recognition memory for such environmental cues than non-offenders. If there is one perspective that is most important for designing out crime, it is the burglar perspective because, ultimately, crime prevention strategies are intended to influence this group.

Physical design should also be considered in conjunction with natural occurrences, such as time of day. Coupe and Blake (2006) incorporated daylight and darkness into their study which sought to determine burglar target preference during weekdays and weekends. The main influences on daytime burglaries were perceptions of occupancy and front cover. Generally, they discovered that high-value detached houses with physical front cover (fences, shrubs etc.) were targeted during the daytime, with the offender usually entering through the front door. On the other hand, townhouses were often targeted at night because offenders were less likely to be seen, despite the possibility that victims were more often at home during the night. However, Coupe and Blake (2006) point out daylight and darkness render different elements as important, meaning those elements influential for increasing or decreasing burglary during the daytime are not equally important at night, and vice versa. For instance, the effect of guardianship was

negligible during night time break and enters, whereas the absence of guardianship was a stronger predictor for break and enters during the daytime.

Townsley et al. (2003) studied repeat victimization of burglaries in Australia arguing that physically homogenous houses within close proximity to a burgled house were more likely to be burgled sometime after the initial burglary. They found residential areas with little housing diversity had more neighbouring houses that were victimized, whereas areas with more housing diversity had more repeat victimizations of the same house. They argue that more similar housing design influences burglars to select targets nearby, rather than re-victimize the initial burgled home, because near-identical looking dwellings eliminates the need for a burglar to choose one over another.

Given the current literature on residential break and enters, support for CPTED principles is mixed. Explanations of residential break and enters are not universal. Moving beyond the empirical variation between the factors described by Newman (1972), Jeffrey (1971) and Clarke (1980), there are additional factors that influence the probability of break and enters. Factors affecting break and enters vary geographically within cities (Malczeski & Poetz, 2005), between countries (Tseloni et al., 2004), and temporally between daytime and nighttime (Coupe & Blake, 2006). To make the causal linkages between design and crime more complex, design cue influence is mediated through individual perceptions and interpretations (Wright et al., 1995; Haw-Robottom et al., 1999). Indeed, there are many factors that exist both objectively and subjectively which influence the decision to commit a break and enter.

The literature has examined CPTED initiatives and residential burglary at length, but there is still work to be done. There remains a relatively small body of work that examines residential burglary from the micro or property level perspective. The extant literature regarding

CPTED measures, the influence of time and space on burglary, and burglar perceptions demonstrates that micro-level analyses are beneficial for looking at the impact that physical design can have on burglary victimization.

Rationale for this Study

Based on the shortcomings of existing research, this study seeks to understand what physical design features of detached residential houses facilitate break and enters when compared with their neighbouring houses. To date, research on burglary has often utilized photos of houses and asked participants to subjectively rate the vulnerability of each house. However, research which objectively compares physical cues between burglarized versus *non*-burglarized houses is limited. Brown and Altman (1983) did conduct a study of burglarized versus non-burglarized houses by visiting those properties and assessing physical cues. However, the lag time between the actual burglaries and the assessments by the researchers was up to 15 months. It is possible that the burglarized and non-burglarized houses changed physical elements on their property, rendering the researchers' assessments inaccurate.

This study aims to contribute to limited research that utilizes site assessments of dwellings to determine what is physically different between burglarized and non-burglarized single unit houses. While burglars' subjective assessments of house vulnerability provide a unique perspective on burglary, assessing actual burglarized properties demonstrates what physical and social characteristics affect actual behaviour. An accurate understanding of the physical cues also requires timely assessments of burglarized properties. Google Earth provides the capability to view properties from both high quality street level and overhead perspectives. This tool can help develop research that provides objective assessments of burglarized versus

non-burglarized houses, while also effectively reducing lag time between the crime and the subsequent data collection. This study assesses which physical and social factors are associated with burglarized and non-burglarized houses.

Chapter Four: Methods

This study aims to assess physical and social characteristics of victimized single-detached houses by examining break and enter data for the city of Guelph. The burglary incident data was used for two main purposes: (1) to compare mapped burglary locations against 2006 Canada census data to infer social characteristics about the neighbourhoods, and (2) to allow for individual site assessments and infer physical characteristics of victimized versus non-victimized properties. Mapping crime data received considerable attention from the Chicago School and the ecological perspective of crime. Official crime data became a telling source of information, especially when it was applied to a city's geographical layout. The realization that crime tended to cluster in certain areas became a point of research and exploration. Shaw and McKay (1969) used official court data to match juvenile offenders' residence locations with tract-level, socio-demographic information for Chicago in order to infer the social environment the offenders occupy. Their comprehensive study demonstrates the explanatory value of using official crime and census data within a given geographical area, but this methodology has also contributed to modern practices of mapping crime and identifying crime hotspots. However, Shaw and McKay ignored a crucial component of the environment in their study. Jeffrey (1971) points out that Shaw and McKay examined only the social environment of individual offenders, thereby ignoring the physical environment in which crimes occur. Newman (1972), Jeffrey (1971) and other modern criminologists argue the physical environment is an integral component of the crime equation, because the environment provides the opportunities for crime.

Assessing physical features of burgled properties has been conducted traditionally by criminologists using three methods. First, researchers have used interviews with key stakeholders (i.e., burglars, victims and police officers) to highlight which design features are perceived as

making a property more or less susceptible to a break and enter (Nee & Taylor, 1988; Brown & Bentley, 1993; Wright, Logie & Decker, 1995; Ham-Rowbottom, Gifford & Shaw, 1999; Cozens et al., 2001; Nee & Meenaghan, 2006). There are two drawbacks with this method. First, these studies measure responses of participants in hypothetical situations, rather than actual burglar behaviours. While these studies capture interesting findings about perceptions of vulnerable houses between different stakeholders, there is no direct connection between physical design features and whether they precipitate or mitigate break and enter. The second drawback is that most of the above mentioned studies utilize photos of victimized and non-victimized properties and ask stakeholders to assess vulnerability based on a variety of situational cues. These photo collections, however, are predetermined by the researchers which means participants are restricted to commenting on just those in the sample, rather than selecting targets from an unlimited supply of houses, such as in real life.

Secondly, researchers have typically drawn from public housing records that specify whether houses had locks, gates and other target hardening measures installed as part of special government initiatives. Researchers have used these mandated property-level design features to supplement entering the field to evaluate properties that have or have not been victimized (Hirschfield et al., 2010). The strength of this method is that the researchers have the necessary information to link the particular target hardening measures implemented at the property level and whether or not the house was burglarized before or after the measures were taken. However, they were only able to assess target hardening measures that were publicly funded, rather than looking at what individuals do to secure their houses independently.

Finally, researchers have developed checklists to assess property-level design features before linking those site evaluations with official break and enter data. The aim is to correlate

police data with site assessments to explain what physical design features appear to influence a burglar's selection of a particular property (Brown & Altman 1983; Coupe & Blake, 2006; Armitage 2011). Site visits provide useful information related to design features and the immediate environment; however, they are time consuming and resource intensive. Depending on the geographic size of the study area, the project could require a large research team and access to transportation in order to conduct as many site assessments as possible in a reasonable time frame (Rundle et al., 2011). Moreover, the time between the actual burglary and the site assessment by researchers can be problematic. For instance, Brown and Altman (1983) completed a 215 item checklist for each site assessment which took anywhere from 15 to 35 minutes. Unfortunately this time consuming data collection method introduced a lag-period of up to 15 months for some site assessments. Some homeowners may have changed various design features by the time the assessment was done. These challenges can be minimized with the advent of free mapping software provided by Google.

Google Earth and Google Street View

Google Earth is a free, Internet-based software tool that became available for public download in June 2005 (Sheppard & Cizek, 2009). The software enables users to view satellite images of the earth's surface at varying resolutions. Google Street View is an additional feature of Google Earth, which became available on May 25, 2007. Google Street View provides users with a 360 degree view of streets by joining images taken approximately ten metres apart (Clarke et al., 2010). The user can situate him or herself on a virtual street in most major urban centres around the world. Criminological research using Google Earth and Street View is non-existent; however, there are a handful of studies in the public health field that have evaluated the

usefulness of using such software to supplement site visits (Clarke et al., 2010; Rundle et al., 2011). Overall, results from these public health studies confirm that Google Earth and Street View are useful tools for conducting site assessments, but researchers caution that site features that are small or exhibit temporal variability are difficult to assess (Clarke et al., 2010; Rundle et al., 2011).

Google Earth and Street View were selected for this study because the software is accessible, cost-efficient and reliable when it comes to assessing temporally stable design features of houses (Clarke et al., 2010; Rundle et al., 2011). The aerial view capability of Google Earth made it possible to discern elements in backyards, such as fences, sheds and shrubs. Google Street View made it possible to assess the front facing elements of individual properties such as territorial markers and sight lines from the street level. The combination of both views made it possible to assess both burglarized and non-burglarized properties in Guelph, Ontario.

Study Area

This study focuses on break and enters in Guelph, Ontario; a city located in South-western Ontario, approximately one-hundred kilometres west of Toronto. In 2006, Guelph's population was 114,940 people with a median age of 36.4 (Statistics Canada, 2010). Guelph is a university oriented city and is home to one of Canada's top comprehensive universities; the University of Guelph.

In 2006, Guelph's housing profile included a total of 44,705 private dwellings (Statistics Canada, 2010). The majority were single-detached houses (53.6 percent) followed by apartments in buildings with fewer than five stories (12.9 percent), apartments in buildings with more than five stories (11.4 percent), row houses (11.4 percent), apartments in duplexes (6.2 percent), semi-

detached houses (4.3 percent) and housing identified as *other* (0.2 percent). The average value of an owned dwelling in 2006 was \$271,502 (Statistics Canada, 2010).

In order to conduct site assessments of burglarized properties, I required access to crime records for the city. Guelph Police Service permitted me to access their break and enter dataset for 2006.² This year was selected for the study because it coincided with, (1) the date Google Earth aerial photos were taken, and (2) it was the most recent year for Canadian census data. The dataset is maintained by the Crime Analysis Unit of Guelph Police and supplemented by incident reports completed by the reporting officer.

Ethical Considerations: Handling Break and Enter Data

Crime data in general is considered sensitive because it includes information related to victims, locations and those charged with offences. That information, if disseminated can have implications for repeat victimization, particularly break and enters. Farrell et al. (1995) state that dwellings are likely to be burgled again because offenders tell others about the dwelling and the items inside. If the dataset for this study was lost or stolen, potential offenders would have access to a list of break and enter locations and incident information which could facilitate repeat victimization - a phenomenon that is well documented by researchers (see Polvi et al., 1990, 1991; Bowers et al., 1998; Robinson, 1998). To ensure this situation did not arise, strict ethical guidelines were established for the study.

Ethics clearance was obtained from the University of Guelph Research Ethics Board on January 25, 2011. In accordance with ethical handling of data, as well as to protect the identities of those attached to break and enter incidents, appropriate measures were taken to minimize

² I worked as a summer student in the Crime Analysis Unit for Guelph Police Service during 2009 and 2010. As required by the Service, I swore an oath of confidentiality and am still bound by this agreement. My previous work as well as the oath allowed me to access the break and enter dataset.

identification of involved parties. Before the data was transported off-site from police headquarters, I de-identified the database by removing suspect descriptions and victim and offender names. I eliminated an excel column dedicated to suspect descriptions and scrupulously deleted names of businesses and individuals that were included from incident reports. Addresses remained in the data set, as this information was needed to code accurate tract-level census data for each property.

The data was transported using an encrypted hard drive which required a password to access the dataset's contents. Knott and Steube (2011) state that encryption safeguards the data even if the hard drive is lost or stolen, because the data is converted to an unreadable format. The only way to decrypt the information is with a key code or password. Miller and Tucker (2011) caution that continual unprotected digitization of data may increase potential data breaches and compromising sensitive information. Therefore, encryption procedures avoid the burglarized addresses from becoming repeat targets, should the hard drive be lost or stolen. The encrypted hard drive was also kept in a locked cabinet in the primary researcher's office as an added level of security.

Information Sharing with Guelph Police Service

Considering the topic of the research, the findings were relevant for Guelph Police Service and their crime prevention approach to break and enters. Therefore, they requested a brief report, summarizing the project. The dataset was the only involvement that Guelph Police have with the project. The service allowed me to exercise academic independence and did not exert any influence over the project whatsoever.

Break and Enter Dataset

The de-identified 2006 dataset included the following relevant variables for each burgled property:

Table 4.1: Break and Enter Information Included in Guelph Police Dataset

Reported Date	The date specifying when the break and enter was reported to Guelph Police Service (dd-mm-yy).
Month	The month of the year in which the break and enter occurred.
Day	The day of the week in which the break and enter occurred.
Address	The location of the break and enter.
Zone	Guelph Police Service divides Guelph into four zones, the west-end (1), the north-end (2), the south-end (3), and downtown (4).
Atom	Guelph Police Service sub-divides zones into atoms for organizational, logistical and police patrol purposes. There are 63 atoms.
Time	Time is categorized as nighttime (N) if the break and enter is reported as occurring between 2300 hours and 0600 hours. Time is categorized as daytime (D) if the break and enter is reported as occurring between 0600 hours and 2300 hours. Time is categorized as unknown (X) if a time was not reported, or the timeframe of the break and enter was too large to specify.
Property Type	Property type identifies the style of dwelling. For example, properties are coded as apartments, townhouses, houses, etc.
Point of Entry (POE)	Specifies where the offender entered the premises as reported by the victim or the police officer.
Modus Operandi (MO)	Specifies how the offender entered the premises as reported by the victim or the police officer.

Break and Enter Sample: Single-detached Dwellings

In 2006, Guelph had a total of 530 reported break and enters. This includes residential, commercial and institutional break and enters. The sample was truncated to focus only on single-detached dwellings³ for several reasons. First, among residential burglaries in Guelph, the majority were committed against single-detached houses. This echoes both Reppetto's (1974) and Nee & Taylor's (1988) findings from incarcerated burglars who prefer to burgle detached, single family dwellings. Second, single-detached houses are the most common dwelling type in Guelph, meaning the findings in this study are applicable to the majority of dwellings in the city.

³ Single-detached houses refer to stand-alone structures with no adjoining wall to another structure.

Finally, single-detached houses provided the clearest use of natural design techniques by homeowners to delineate their property. From the 530 break and enters in Guelph, 238 involve single-detached houses. This sample includes both successful and attempted break and enters. Thirty-four break and enter attempts were made on single-detached dwellings in 2006. These attempts were included in the sample because there is still the assumption that an offender judged initially that house as a target. Eighteen cases were subsequently eliminated from the sample due to insufficient information provided by aerial and street-level photos, or incongruence between aerial and street level images. The cause for the incongruence is discussed later in the limitations section of this chapter.

Two-hundred and twenty reported break and enters in Guelph were plotted and visually assessed by both aerial and street-level photos to determine the presence or absence of several CPTED design features. One frequent issue with Google Earth was its inability to accurately locate property addresses. Fortunately, the City of Guelph provides an online, interactive map based on the city's geographical information system (GIS)⁴, complete with accurate property addresses. Property numbers were identified with the City of Guelph map and then matched with Google Earth images to ensure the right properties were assessed.

Similar to the victimized dwellings, site assessments were performed on the neighbouring houses located to the left, right and across from the victimized property. The non-victimized dwellings provide a comparison group to determine CPTED's efficacy. If any of the three neighbouring properties were not residential houses, a site assessment was not conducted because physical design features of that property could not be properly compared to the burgled properties. In total, 585 neighbouring, non-victimized site assessments were completed for residential houses. Seventy-five were excluded because they were not residential houses. The

⁴ The City of Guelph mapping tool can be found at www.maps.guelph.ca

final sample consisted of 220 burgled properties, 585 non-burgled properties, and 805 properties in total.

Key Measures Used in Site Assessments

Site assessments were based on core CPTED principles: *access control*, *natural surveillance*, *image* and *territoriality*. These core elements were operationalized using dichotomous, multinomial and scaled variables. These were barriers around the property, a division between front and back yards, garage, shed, street type, house visibility, setback from road, obscured main entrance, corner lot, proximate lot zoning or usage, and the general upkeep of the property. Additional census tract-level data that was incorporated included low-income areas, unemployment rates, percentage of visible minorities and households with single parents and/or couples with children.

Access Control

Crowe (2000) indicates that access control is a design concept used to deny criminals access to targets and increase the perceived risks for a burglar. Access control can take three forms: organized (guards), mechanical (locks) and natural (property definition). Crowe (2000) notes that traditional crime prevention favoured the mechanical and organized methods of access control (Newman, 1972), but that contemporary CPTED practitioners prefer natural methods. Therefore, the variables assessed here focus on naturally occurring access control measures.

1. Barriers

Barriers refer to either physical or symbolic site characteristics that are present or absent on the dwelling properties. Researchers define symbolic barriers as characteristics of the house

that demonstrate personal property or identity, but also convey a message to others that the homeowner cares about his or her property (Brown & Altman, 1983; Ham-Robottom et al., 1999). Brown and Altman (1983) consider features such as hedges, rock borders, name plates and welcome mats to be symbolic barriers. For this study, Google Street View's zoom capability and quality could not identify doormats or nameplates, so symbolic barriers encompassed shrubs and hedges, gardens and trees.

Physical barriers are actual obstructions that prevent someone from accessing the property. Although Ham-Robottom et al. (1999) consider fences and hedges physical barriers, hedges were not considered physical barriers in this study because they ranged from sparsely populated to fully surrounding a property. Physical barriers were restricted to objects that hindered one's ability to enter the property, such as fences and/or dense trees. Barriers were assessed for each side of the property: the front, front-right, front-left, back, back-right and back-left. Each barrier was coded as one of the following:

Table 4.2: Coding Items for Barrier Variable

Fence	A low, chain link or decorative fence that still allows people to see easily through or over.
Fence (opaque)	People cannot see through or over the fence, such as a typical wooden fence.
Garden	Low lying gardens which allow people to see over top.
None	There are no barriers present on this side of the property.
Shrubs/Hedge	Includes both sparsely placed and full lines of shrubs.
Trees	At least two trees on this side of the property and still allows people to move between or around them.
Trees (dense)	Excessive trees on this side of the property, making it difficult to move easily between or around them.
Not Sure	Unable to tell if, or which type of barrier exists.

After the assessments were made, barriers were grouped into a new variable which specified whether the barrier was symbolic or physical.

2. *Front/Back Division*

A front/back division denotes whether the property had a physical division between the front and back yards. Ham-Rowbottom et al., (1999) asked their participants to consider if a front/back division increased or decreased a homeowner's chance of victimization. They found a significant correlation between the presence of a front/back division and participants perceiving the property to be less susceptible to burglary. While their study focused on judgments from police officers, residents, and burglars, this study uses this same cue as it relates directly to burglar behaviour⁵.

3. *Access Street Type*

Access street type refers to the road on which the property is located. The work of Brantingham and Brantingham (1984, 1993) shows that burglaries cluster around major roadways because these paths are often travelled by burglars during their daily routines. Police services, therefore, often advocate for street designs with single entry and exits (such as cul-de-sacs) because they reduce multiple escape routes, increase perceived risk for offenders and restrict through-traffic (Schneider & Kitchen, 2007, Armitage, 2011). This study coded road type into one of the following categories:

Table 4.3: Coding Items for Access Street Type Variable

Cul-de-sac	A dead end with loop around a centre island.
Crescent	An alternate roadway connecting major routes, less traffic than two-way a street.
Dead End	There is no loop like the cul-de-sac, the street ends abruptly.
One-way	The traffic flows one-way, indicated by street signs.
Two-way	The traffic flows both ways.

⁵ Behaviour refers to whether or not the burglar commits a break and enter at that dwelling.

4. *Garage*

The presence or absence of a garage at burglarized properties was examined by prior researchers (Brown & Altman, 1983; Ham-Robottom et al., 1999). These studies concur that the presence of a garage is associated with non-burglarized properties. In fact, Brown and Altman (1983) consider a garage to be a proxy measure for traces of occupancy. This study did not examine traces of occupancy because there is no way to determine whether the dwelling looks occupied at the time the break and enter was committed. Instead, a garage was considered under access control because it provides an additional entry point for burglars. The garage variable was categorized as one of the following:

Table 4.4: Coding Items for Garage Variable

Attached Garage	Garage shares an adjacent wall or walls with the house. This does not include overhang spaces for vehicles.
Detached Garage	The garage is an independent, free-standing structure.
No Garage	The property does not have a garage.

5. *Shed*

Sheds were treated as a dichotomous variable which denoted whether or not the property had a shed present. Similar to the garage variable, sheds were considered an access control variable because they provide an entry point for burglars.

Natural Surveillance

Similar to access control, Crowe (2000) argues that mechanical and organized forms of surveillance have been superseded by using natural surveillance as an effective preventative measure against crime. Theoretically, the more opportunities provided for natural surveillance to occur, the less likely it is that a criminal will commit a crime in that particular area. Multiple

studies argue that surveillance has an impact on break and enters (see Brown & Altman 1983; Nee & Taylor, 1988; MacDonald & Gifford, 1989; Shaw & Gifford, 1994; Ham-Robottom et al., 1999; Coupe & Blake, 2006). Ham-Robottom et al. (1999) found significant correlations with the three natural surveillance variables used in this study and police officers' perceptions of dwelling vulnerability. Dwellings that had setbacks of less than 20 feet, that could be seen from the road, and that had a front door visible from the road, were all perceived as less susceptible to burglary. Following the theoretical and empirical research, these three variables were included to assess the impact of natural surveillance on break and enters.

1. *Setback*

Setback was determined using the ruler function in Google Earth. The ruler measured the distance from the road side to the nearest wall on the front of the house. For example, houses with protruding garages were measured from the roadside to the garage, not the front door.

2. *Visible from Road*

This is a dichotomous variable which indicates whether the house was visible when looking at the property using Google Street View.

3. *Obstructed Main Entrance*

As an extension of the previous variable, Google Street View images were used to determine whether or not my view of the front door was unobstructed, or partially or fully blocked by foliage on the property.

Image

Newman (1972) advocates for building design that mitigates the stigmatization associated with public housing. For Newman, a positive appearance conveys that residents care for and will

protect their space. This concept is reflected in Wilson and Kelling's (1982) broken windows theory, which holds that visible signs of decay or disorder precipitate more disorder and crime. The underlying assumption is that disorder communicates to offenders that no one cares about the space and that criminal behaviour will likely go challenged. Empirical support for broken windows theory is weak, however. Skogan's (1990) book entitled *Disorder and Decline* found a significant relationship between disorder and victimization. However, just over a decade later, Harcourt (2001) replicated Skogan's work and discovered that Skogan's methods were wrought with data manipulation and that insignificant results were excluded. For instance, Skogan only reported the significant relationship between disorder and robbery victimization, while suppressing the four other non-significant relationships between disorder and other types of crime (Harcourt, 2001).

The role of image has been examined in many residential burglary studies and results have been mixed. Interview-based studies indicate that burglars' decisions to commit a break and enter are influenced by a dwelling's image or perceived value (see Nee & Taylor, 1988; Nee & Meenaghan, 2006). Cozens et al.'s (2001) results show that four out of five housing types considered well maintained were rated as good targets by burglars because of the property that could be taken from the dwelling. However, other studies have found a non-significant relationship between dwelling image and perceptions of vulnerability to break and enters (see Wright et al., 1995, Ham-Robottom et al., 1999). To date, research on image and its influence on the probability of dwelling victimization is inconclusive. This study helps to clarify image as a potential factor in property victimization by assessing its potential impact with a variable called upkeep.

1. Upkeep

The variable upkeep refers to whether the property was well kept or not. Each property was recorded as either poor, average or excellent in terms of the upkeep. The upkeep assessment looked at the maintenance of property (debris, clutter, or garbage on the property and general maintenance of gardens and lawn), and physical signs of house degradation. See appendix B for examples of poor, average and excellent properties with respect to upkeep.

Territoriality

Newman (1972) refers to territoriality as the division or zoning of space which contributes to the development of sentiments amongst residents that they have exclusive rights or control over the area. Territoriality is more difficult to quantify with site assessments, compared to other CPTED elements, because it encompasses residents' feelings and perceptions. Moreover, the concept is not mutually exclusive from other design measures. Crowe (2000) argues that access control and surveillance contribute to territoriality, while Brown and Altman (1983) argue that territoriality influences residents to maintain their properties more regularly. CPTED's core principles are always independent and often reinforce or influence each other, as is evident with the concept of territoriality.

Despite the difficulties in assessing territoriality, I based the design of my variables on the work of Altman (1977), who posits that there are three types of territories that exist along a continuum - public territories at one end and primary territories at the other. Public territories are spaces that are accessible to all users of the space. For these areas, it is argued that there is a low level of territoriality because no one can claim exclusivity to that area. Primary territories, on the other hand, are the equivalent of private properties where the level of territoriality for the

homeowner is high (Altman, 1977). I used this continuum to help develop the variables related to territoriality. Dwellings were assessed on whether they occupied a corner lot and/or whether they shared a property border with mixed land usage. The assumption with both of these variables is that houses that are on a corner lot or border other areas would reduce the homeowner's ability to exert territorial control, because they are close to areas that are considered public spaces with less proprietorship.

1. Corner lot

Armitage (2011) utilized fieldworkers to conduct a rigorous study of residential design and crime, focusing on case studies of 12 areas in the United Kingdom. She discovered a marginally significant relationship between properties located on corner lots and their susceptibility to crime. Based on marginal support for corner lots precipitating crime, whether dwellings were located on the corner was explored in this study to determine if any relationship exists. A house was considered to occupy a corner lot if it shared at least two sides with a roadway.

2. Proximate Land Use

Land use and zoning was assessed for all sides of the property (front, left, right and rear). The categories of zoning were defined as:

Table 4.5: Coding Items for Proximate Land Use Variable

Commercial	The land was zoned for commercial purposes (shopping and businesses).
Institutional	The land was zoned for schools, churches and parks.
Natural Undeveloped	The land was not yet zoned for development.
Residential	The land was zoned for houses, housing complexes and apartments.
Road	The land use was a road. If a house had a road directly in front of it, perpendicular at an intersection, this option was selected for land use in front of the house that was assessed.

Additional Aggregate Data: Canada 2006 Census

In addition to the physical characteristics of each household, tract-level census data were coded for each property. Aggregate social factors that are discussed in the research literature were obtained from Statistics Canada. These data were obtained in aggregated form and were divided by tracts. Guelph has 28 different tracts dividing the city into distinct neighbourhoods. The divisions are typically along major roadways and in some cases, correspond directly with Guelph Police Service's divisions of areas into atoms. The 2006 tract level data for Guelph was available in virtual map format. These maps were saved in jpg format and then overlaid on a map of Guelph using Google Earth. Individual victimized and neighbouring houses were then matched to the corresponding tract level data for each of the five social factors chosen for analysis. Tract level data included (1) the percentage of the population in low income in 2005, (2) unemployment rate for those 15 years and older, (3) the percentage of visible minorities, (4) percentage of private households containing couples with children under 25 years old, and (5) percentage of families with a single parent.

4. Low Income Areas and Unemployment Rates

Both low income areas and unemployment rates are included to assess the relative prosperity of certain tract areas in Guelph and to identify those areas considered high, middle and low income. There is no consensus regarding the effect that household income has on break and enters. Several studies have concluded that a positive correlation exists between household income and break and enter victimization (Repetto, 1974; Miethe et al., 1987). However, a study by Cohen and Cantor (1981) showed that victimization was greater on either end of the income spectrum, meaning those with the lowest and highest incomes were more susceptible to break and enters. Low income and unemployment rates were included in the dataset to address

inconsistent findings in the literature regarding income levels, but also to determine how this social factor relates directly to homeowners' property management.

5. *Visible Minorities*

The choice to include tract level information pertaining to visible minorities stems from past research. Reppetto (1974) suggests that areas with more racially diverse populations experience higher crime rates because diversity translates into less social stability. More simply put, those who live in diverse areas are less likely to exert social control over the space, allowing potential deviant behaviour. Likewise, Bernasco and Nieuwebeerta (2005) conclude that ethnically heterogeneous neighbourhoods are more susceptible to break and enters because heterogeneity can decrease the amount of guardianship exerted by neighbourhood residents.

6. *Households with Single Parents and Couples with Children*

Households with more persons on the premise can expect to have longer and more frequent levels of occupancy than single parent households. Waller and Okihiro (1978) found through interviews with incarcerated burglars that the burglary rate was lower for households with two-parent families and families with more members. Additionally, this relationship was more pronounced for houses than apartments. They attribute this relationship to increased levels of surveillance and occupancy associated with larger families in a particular dwelling (Waller & Okihiro, 1978). The argument that single person households exhibit less guardianship over their home has been supported by research both at the neighbourhood level (Felson & Cohen, 1980) and the property level (Maxfield, 1987; Sampson, 1987). Hindelang (1976), however, concluded that single person households experience the lowest rate of victimization. The current study includes households with single parents, but also households with couples and children, to

determine the impact these social factors can have on burglary either directly or indirectly by mediating certain design features.

Tract-level census maps from 2006 were overlaid on the city of Guelph as a semi-transparent image layer. The map was then adjusted to city boundaries and major roadways as a means to properly orient and size the census map. Based on the geo-spatial location of each burgled and non-burgled address, a number was assigned that corresponded to the proper category of poverty level and unemployment level, visible minorities, and households with single parents or couples with children. Although tract-level data cannot be correlated with specific properties from the dataset, tract-level information provides an additional layer to the complex interrelationship between the physical and social factors that either exacerbate or mitigate break and enters.

Analytic Strategy

The 805 site assessments that were recorded in Microsoft Excel were imported into SPSS statistical software for analysis. First, frequency distributions were tallied for each variable in the study, including the variables provided by the Guelph Police Service, as well as the physical site assessments, which includes the tract-level data. Second, bivariate relationships were examined using contingency tables. Each variable measured during the site assessments was independently analyzed against the variable indicating if the property was burgled or not, to determine if any significant relationship was present. This same process was repeated for each site assessment variable, while controlling for each of the five census variables, as well as the geographical zone of the city. Finally, based on significant relationships discovered at the bivariate level of

analysis, multivariate analyses were performed to determine which social and physical variables best predicted break and enters in Guelph.

Limitations and Challenges

Any criminological research which uses official data must be aware of unreported crimes. These unreported crimes are collectively known as the dark figure of crime (Biderman & Reiss, 1967). However, the effect of the dark figure of crime is less pronounced for break and enters than it is for other types of crime. Maguire (1982) argues that break and enters are typically reported by victims, which minimizes police discretion and leads to better reporting of this type of crime. That being said, reporting is not consistent for all break and enters. According to Greenberg and Beach (2004), break and enter victims' decisions to notify the police are influenced by three factors. Victims are more likely to notify police if the property lost is deemed worth reporting, there is a significant level of fear experienced, and/or victims are advised by others to notify the police. Moreover, they discovered break and enter victims were three-and-a-half times more likely to notify police than victims of theft (Greenberg & Beach, 2004). The first factor is particularly relevant for attempted burglaries, because homeowners may not know that an attempt was made on their home, or not consider it important enough to report to police.

The second major limitation concerns Google Earth and Street View. There is a time delay between the software's aerial and street-level photos. The aerial photos of Guelph were taken in 2006; however, the street-level images were not completed until 2009. I recognize this incongruence between aerial and street images is problematic; however, as mentioned earlier, in cases where the incongruence was evident (e.g., a property under construction from the aerial image but fully constructed in the 2009 street level image), the case was removed from the

analysis. Despite the three year gap between the images, the CPTED variables assessed were overwhelmingly identical between the aerial and street-level views, meaning these features did not vary significantly over time. The steps taken to alleviate the shortcomings of Google Earth and Street View ensure that the results of this study are based on accurate and complete site assessment data.

Chapter Five: Results

The break and enter data and site assessments in Guelph demonstrate little support for natural CPTED measures being effective deterrents against victimization. Recall from Chapter 1 that Crowe (2000) advocates for natural CPTED measures to be included in design, rather than mechanical or organized measures, because they are less intrusive to those using the space. The results are divided into four sections. The first two sections examine the summary data and provide an overall description of the break and enters. The first section examines only the victimized properties, while the second section examines the larger sample of both victimized *and* non-victimized properties. Victimized properties show interesting temporal and spatial trends, but there are also patterns related to a burglar's point of entry and *modus operandi*. Site assessment summary data speak to the onset of large residential developments with little variability between houses. Third, bivariate analysis results are presented, highlighting some of the important correlations between CPTED variables and victimized dwellings. These relationships are most notable for the site assessment variables: garage, proximate land use, and property upkeep. While the third section evaluates CPTED elements directly, another major purpose of this study is to understand what makes dwellings more susceptible to burglary by developing a predictive model. In the fourth section, multivariate analyses identify the physical factors that best predict break and enter victimization, while controlling for garage, proximate land use and upkeep.

Summary Data: Victimized Properties

Considerable theoretical and empirical attention has been paid to the temporal distribution of burglary. Like other social phenomenon, incidents of burglary occur in ebbs and

flows. Maguire and Bennett (1982) argue that a key explanation for the temporal patterns is that burglars try to avoid confrontation with dwelling occupants. More simply put, burglars burgle while homeowners are away or asleep. The temporal distributions of break and enters for Guelph are largely consistent with past research.

Break and enters were most prevalent during the summer months of June and July, accounting for 10.9 percent and 15 percent of the total burglaries in 2006, respectively (Figure 5.1). Break and enters in Guelph for 2006 show a continual increase until the middle summer months and then taper off for the rest of the year, with the exception of January, March, and December. The increase in these three months coincides with winter and March breaks for schools and the university. It is possible that homeowners are away for extended periods of time during these months, which could explain the spikes in break and enter occurrences.

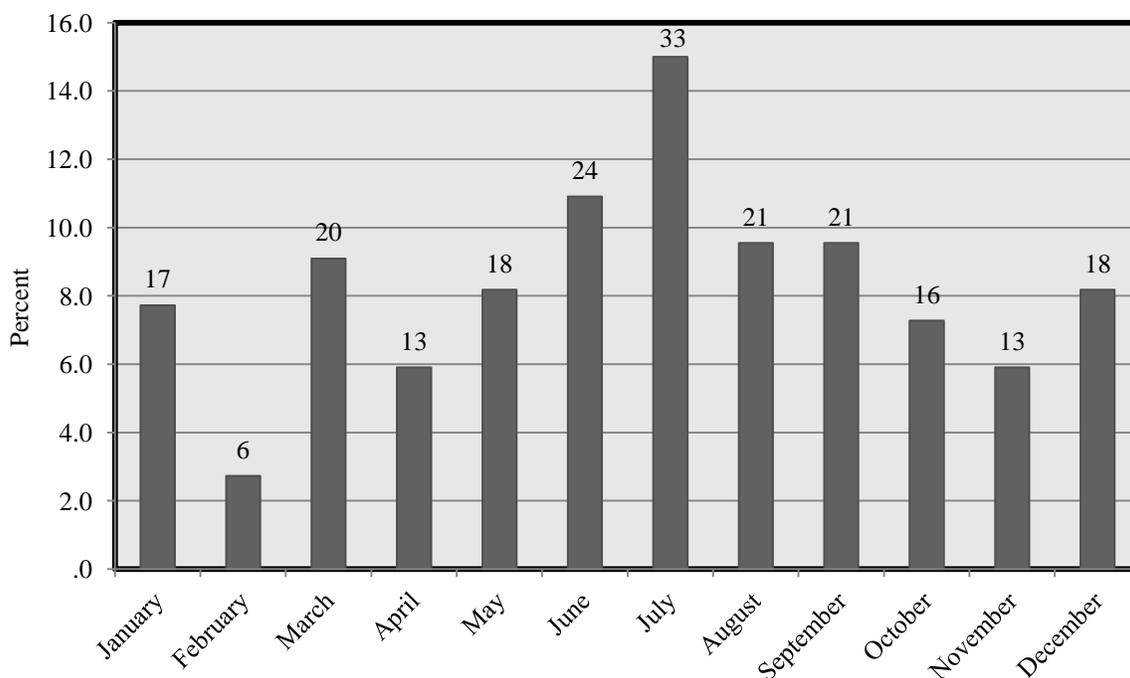


Figure 5.1: Monthly distribution of break and enters for Guelph, 2006 (N=220).

Break and enter occurrences are unevenly distributed throughout the days of the week, with peaks on Mondays and Tuesdays. Break and enters occurred less on Wednesdays and Saturdays (Table 5.1).

Table 5.1: Break and Enter Weekly Temporal Distributions

Day of the Week	Frequency (n)	Percentage (%)
Sunday	34	15.5
Monday	43	19.5
Tuesday	37	16.8
Wednesday	19	8.6
Thursday	32	14.5
Friday	34	15.5
Saturday	21	9.5
Total	220	100.0

Most burglaries occurred during the night⁶ followed by day time burglaries, as presented in Table 5.2.

Table 5.2: Break and Enter Daily Temporal Distributions

Time of Day	Frequency (n)	Percentage (%)
Day	75	44.1
Night	95	55.9
Not Sure*	50	--
Total	220	100.0

*Recoded as missing value in dataset

Based on past research (Cohen & Felson 1979; Maguire & Bennett, 1982; Coupe & Blake, 2006), it was worthwhile to analyze the relationship between weekday versus weekend break and enters. Cohen and Felson (1979) argue that burglaries occur more when homeowners are away, which means daytime victimization during the week when people are at work and night time break and enters on weekends when homeowners are out for the evening. Monday to

⁶ Guelph Police Service codes burglaries from 11pm to 6am as night time burglaries and those from 6am to 11pm as day time burglaries.

Friday were coded as weekdays, while Saturday and Sunday were coded as the weekend. The relationship between time of the week, and when the break and enter occurred is statistically significant ($p < .05$). Weekday burglaries are almost split between the daytime (62) and night time (63). However, 71 percent of weekend break and enters occurred during the night (Table 5.3).

Table 5.3: Time of Burglary by Weekday and Weekend

		Time of Week		
		Weekday	Weekend	Total
Time of Burglary	Daytime	62	13	75
		49.6%	28.9%	44.1%
Night time	63	32	95	
		50.4%	71.1%	55.9%
Total		125	45	170
		100.0%	100.0%	100.0%

$$\chi^2 = 5.757, p < .05$$

To understand the spatial distributions of burglaries in Guelph, incidents were recorded according to one of the four city zones (Table 5.4). Zone three had the most break and enters (38 percent), followed closely by zones one (31 percent) and two (30 percent) respectively. Zone four had the lowest incidence of break and enters (1 percent). The likely explanation is that zone four is the downtown core which has fewer single-detached dwellings and/or residential areas (Table 5.4).

Table 5.4: Break and Enter Spatial Distributions According to Zone

Zone	Frequency (n)	Percentage (%)
1	68	30.9
2	66	30.0
3	84	38.2
4	2	0.9
Total	220	100.0

The point of entry a burglar chooses can be influenced by several factors, including: ease of access from a certain side of the dwelling and the risk of being seen by onlookers. Maguire's (1982) results show a preference amongst burglars for rear entries. However, my results indicate that most burglars entered a residence through the front. The rear entry was the second most preferred point of entry for burglars (Table 5.5). I speculate that this is because most dwellings had a fence surrounding the rear of the property, which may deter burglars from entering from the back.

Along with point of entry, an offender chooses the method of how he or she will enter the dwelling. The results show that most burglars (59 percent) used less forceful means to enter a residence, such as going through an open or unlocked door or window. Of those break and enters where the method of entry was reported, 41 percent of burglars opted to commit a forceful entry, such as kicking a door, using a pry bar or breaking a window (Table 5.5).

Table 5.5: Break and Enter Incident Information

Variable	Variable Categories	Frequency (n)	Percentage (%)
Point of Entry	Front	93	47.9
	Side	24	12.4
	Rear	77	39.7
	Not Sure*	26	--
	Total	220	100.0
Modus Operandi	Forced Entry	83	41.3
	No Forced Entry	118	58.7
	Not Sure*	19	--
	Total	220	100.0
Attempt	Yes	33	15.0
	No	187	85.0
	Total	220	100.0

* Recoded as missing value in dataset

A chi-square test was performed on point of entry and method of entry (Modus operandi) to gain a better understanding of burglars' behaviours. The relationship between a burglar's

method of entry, and where they entered the residence was statistically significant ($p < .01$). Proportionately, of those burglars who used forced entry, 49 percent entered through the rear and 19 percent entered through the side. On the other hand, of those burglars who did not force to enter the dwelling, 59 percent entered through the front of the residence, while 31 percent and 9 percent entered through the rear and side of the residence, respectively (Table 5.6).

Table 5.6: Modus Operandi by Point of Entry

		Modus Operandi		
		Forced Entry	No Forced Entry	Total
Point of Entry	Front	24 32.4%	63 59.4%	87 48.3%
	Rear	36 48.6%	33 31.1%	69 38.3%
	Side	14 18.9%	10 9.4%	24 13.3%
	Total	74 100.0%	106 100.0%	180 100.0%

$\chi^2 = 13.002, p < .01$

These findings support Clarke and Cornish's (1986) rational offender who will take more time, or is more aggressive, when the chance of being seen at the side or rear of a property is less likely. Based on the findings here, one can speculate that some burglars appear to simply check residences, looking for open or unlocked front doors or windows because it is inconspicuous and quick.

Overall, the sample of burgled dwellings shows that break and enters peak during the summer months, tend to occur at night (especially on weekends), and are more prevalent in zone three (an area characterized by suburban sprawl). *Modus operandi* appears related to which side

of the residence a burglar chooses to enter. The next section discusses the physical and social variables assessed for both victimized and non-victimized properties.

Summary Data: Victimized and Non-Victimized Properties

Recall from the methods chapter that all victimized and non-victimized properties were coded for the presence of physical variables. These variables were designed to assess the CPTED design principles: access control, natural surveillance, image and territoriality. The summary data for each physical variable is presented according to its respective CPTED element.

Access Control

Barriers, property division, garage, shed and street type were all assessed to determine the effect of access control (Table 5.7). The majority of front lawns had a front symbolic barrier, while the majority of backyards had physical barriers on all sides. Fifty-three percent of properties had no physical division between the front and back yard (e.g., a fence with a gate), meaning access between the front and back yards was unobstructed. The majority of dwellings had an attached garage, but did not have a shed. Finally, most properties were located on two-way streets.

Natural Surveillance

Site assessments showed the majority of properties were situated between 30 to 49.9 feet from the roadside curb; the mean setback for all properties was 42 feet. It is evident there were few houses in the sample with setbacks greater than 50 feet. Most houses were visible from the road and had a main entrance that was unobstructed (Table 5.8). It is therefore likely that most

Table 5.7: Site Assessment Summary Data for Access Control

Variables	Variable Categories	Frequency (n)	Valid Percentage (%)
Front Barriers	Physical	26	3.2
	Symbolic	630	78.6
	None	146	18.2
	Not Sure*	3	--
	Total	805	100.0
Front-Right Barriers	Physical	80	10.0
	Symbolic	346	43.0
	None	378	47.0
	Not Sure*	1	--
	Total	805	100.0
Front-Left Barriers	Physical	89	11.1
	Symbolic	348	43.3
	None	367	45.6
	Not Sure*	1	--
	Total	805	100.0
Rear Barriers	Physical	559	72.1
	Symbolic	160	20.6
	None	56	7.2
	Not Sure*	30	--
	Total	805	100.0
Rear-Right Barriers	Physical	498	65.3
	Symbolic	156	20.4
	None	109	14.3
	Not Sure*	42	--
	Total	805	100.0
Rear-Left Barriers	Physical	499	65.2
	Symbolic	148	19.3
	None	118	15.4
	Not Sure*	40	--
	Total	805	100.0
Front-Back Division	Yes	371	47.0
	No	418	53.0
	Not Sure*	16	--
	Total	805	100.0
Garage	Attached	437	54.3
	Detached	124	15.4
	No	244	30.3
	Total	805	100.0
Shed	Yes	227	30.2
	No	524	69.8
	Not Sure*	54	--
	Total	805	100.0
Street Type	Crescent	107	13.1
	Cul-de-sac	22	2.7
	Dead End	40	5.0
	One-way	7	0.9
	Two-way	629	78.1
	Total	805	100.0

*Recorded as missing value in dataset

properties in the sample were easily seen from the road and homeowners were likewise able to view the fronts of neighbouring houses with little to no visual obstructions. The results demonstrate that front-facing natural surveillance was, for the most part, unobstructed in this sample. However, it is important to remember that CPTED elements are not mutually exclusive, and an increase of one element can negatively influence another (Jeffrey 1971, Crowe 2000). For instance, the solid fencing in the backyards of the properties assessed can actually mitigate effective natural surveillance between properties.

Table 5.8: Site Assessment Summary Data for Natural Surveillance

Variables	Variable Categories	Frequency (n)	Valid Percentage (%)
Setback (measured in feet)	0.1-9.9	4	0.5
	10-19.9	46	5.7
	20-29.9	117	14.5
	30-39.9	267	33.2
	40-49.9	271	33.7
	50-59.9	49	6.1
	60-69.9	17	2.1
	70-79.9	3	0.4
	80+	31	3.9
	Total	805	100.0
House Visible from Road	Yes	800	99.4
	No	5	0.6
	Total	805	100.0
Obstructed Main Entrance	Not at all	703	87.7
	Somewhat	81	10.1
	Completely	18	2.2
	Not Sure*	3	--
	Total	805	100.0

* Recoded as missing value in dataset

Image

The one variable associated with image shows the majority of properties were rated as average, followed by those rated as excellent and poor, respectively (Table 5.9).

Table 5.9: Site Assessment Data for Image

Variables	Variable Categories	Frequency (n)	Valid Percentage (%)
Upkeep	Poor	61	7.6
	Average	454	56.4
	Excellent	290	36.0
	Total	805	100.0

Territoriality

Most of the sample properties were not corner lots and the proximate land use data show surrounding land use was mainly residential. In addition, few properties were surrounded by mixed land use (Table 5.10).

Table 5.10: Site Assessment Summary Data for Territoriality

Variables	Variable Categories	Frequency (n)	Valid Percentage (%)
Corner Lot	Yes	148	18.4
	No	657	81.6
	Total	805	100.0
Proximate Land Use	All sides are residential land use	533	66.2
	One side is mixed land use	217	27.0
	Two sides are mixed land use	44	5.5
	Three or more sides are mixed land use	11	1.4
	Total	805	100.0

2006 Census: Social Data

The majority of single detached dwellings assessed were located in census tract areas containing less than ten percent of the population below the low income line (Table 5.11). Similarly, the majority of properties in the sample were located within tract areas where the unemployment rate was between four and six-and-a-half percent. Thus, the two indicators of income demonstrate the sample was largely from areas with relatively little poverty and/or unemployment. The social data for household composition showed that census tracts ranged from having low to high percentages of single parent families. Similarly, tract areas with varied

percentages of couples and children were all represented; few houses from the sample (5.8 percent) were located in areas where families comprised about one-third of the population. Finally, the properties in the sample were clustered in census tracts with relatively low percentages of visible minorities; 92 percent of dwellings in the sample were located in tracts where visible minorities comprised a maximum of 19 percent of the population in that area (Table 5.11). Thus, the sample was comprised of dwellings in tracts that are largely homogeneous and have little ethnic variation.

Table 5.11: Site Assessment Summary Data for 2006 Census Information

Variables	Variable Categories	Frequency (n)	Valid Percentage (%)
Percentage of population in low income after tax	20-33.2%	3	0.4
	10-19.9%	203	25.2
	<10%	599	74.4
	Total	805	100.0
Unemployment rate for population 15 years and over	6.6-9.9%	198	24.6
	4-6.5%	487	60.5
	0-3.9%	120	14.9
	Total	805	100.0
Percentage of private households containing couples with children under age 25 at home	36-100%	284	35.3
	29-35%	47	5.8
	22-28%	282	35.0
	0-21%	192	23.9
	Total	805	100.0
Percentage of Census Families who are lone parent	20-67%	165	20.5
	16-19%	238	29.6
	12-15%	186	23.1
	0-11%	216	26.8
	Total	805	100.0
Percentage of visible minorities	30%+	34	4.2
	20-29%	27	3.4
	10-19%	378	46.9
	<10%	366	45.5
	Total	805	100.0

Overall, the most common dwelling type in the sample was located in a relatively affluent tract area with few visible minority households. It was on a two-way street, not on a corner and surrounded largely by residential land use. The dwelling typically had gardens,

hedges or trees on the front lawn and a backyard that was fenced in. There was typically a fence dividing the front and back yards, an attached garage and no shed on the property. It was set back between 30 to 50 feet from the road, and the house was visible from the road, including the front door. The house itself was considered to be average in terms of upkeep and maintenance.

Bivariate Analyses

Moving from the description of house and neighbourhood characteristics for the sample, this section identifies the key relationships between property design and break and enter victimization. The purpose of identifying the physical correlates of break and enters is vital for determining the efficacy of CPTED. Eck (2002) argues that CPTED proponents and practitioners advocate for homeowners and developers to incorporate elements of access control, natural surveillance, image and territoriality into their property design, even though empirical support for CPTED is mixed. In this study, bivariate analyses indicate that there is little empirical support for CPTED measures effectively deterring break and enters. Contingency tables were constructed and analyzed for each site assessment variable in the dataset. Variable relationships are presented below, within the categories of access control, natural surveillance, image and territoriality.

Access Control

The only access control variable significantly associated with break and enters was the presence of a garage. Proportionately, dwellings with both attached and detached garages were victimized more often (Table 5.12). While the presence of a garage was significantly related to break and enters, barriers, front-back division, street type and shed were not.

Natural Surveillance

No significant findings were found with respect to setback from the curbside, whether the dwelling was visible or not, or how much the front entrance was obstructed: these findings are perhaps not surprising given the data's concentration in only a few categories. For example, cases for dwelling visibility indicated overwhelmingly that the sample dwellings were visible from the road (99.4 percent).

Table 5.12: Burglary Status by Type of Garage on Property

		Burglary Status		
		Burgled	Not Burgled	Total
Garage	Attached	127 57.7%	310 53.0%	437 54.3%
	Detached	44 20.0%	80 13.7%	124 15.4%
	No Garage	49 22.3%	195 33.3%	244 30.3%
Total		220 100%	585 100%	805 100%

$$\chi^2 = 11.265, p < .01$$

There was hardly any variation in property visibility; explanations pertaining to natural surveillance were insufficient because the site assessment data lacked variability. Moreover, Guelph's residential zoning by-laws dictate that dwellings must be set back from the roadway at least six metres, or 19 feet and eight inches (City of Guelph, 2012). These regulations restrict variability in setback, whereas a comparative study of two cities with differing zoning by-laws might yield more varied results for measures of natural surveillance.

Image

The results presented in Table 5.13 indicated that, proportionately, more victimized properties were rated as poorly kept (12 percent) than non-victimized properties. This finding supports Wilson and Kelling's (1982) broken windows theory, wherein they argue that physical disorder is linked to more serious types of crime; however the link between disorder and crime is not fully understood. St. Jean (2007) argues that physical disorder conveys different messages to both law abiding citizens and offenders. For law abiding citizens the link between disorder and crime is indirect because citizens become fearful and apprehensive about exerting control over the space. For offenders, physical disorder implies no one cares about the space; therefore, offenders believe they can operate without resistance from others (St. Jean, 2007).

Table 5.13: Burglary Status by Upkeep of Dwelling

		Burglary Status		
		Burgled	Not Burgled	Total
Upkeep of Dwelling	Poor	26	35	61
		11.8%	6.0%	7.6%
	Average	119	335	454
		54.1%	57.3%	56.4%
	Excellent	75	215	290
		34.1%	36.8%	36.0%
	Total	220	585	805
		100%	100%	100%

$$\chi^2 = 7.784, p < .05$$

Territoriality

Mixed land use was one of Jane Jacobs' (1961) recommendations to help alleviate crime and deviant behaviour, because the mixture of activities in an area provides a steady level of natural surveillance. However, as seen with prior results, an increase in one CPTED element can

negatively affect another because the elements are not mutually exclusive. The results in Table 5.14 demonstrate that burglary is associated with mixed land use. Proportionately, more victimized dwellings shared at least one side of the property with non-residential land use, while more non-victimized dwellings were surrounded entirely by other residential properties (69 percent). The corner lot variable was not significantly associated with break and enters. Full results of variables that rendered no significant results are provided in appendix B.

Table 5.14: Burglary Status by Proximate Land Use

		Burglary Status		
		Burgled	Not Burgled	Total
Proximate Land Use	All Sides Residential Land Use	130 59.1%	403 68.9%	533 66.2%
	One Side Mixed Land Use	65 29.5%	152 26.0%	217 27.0%
	Two Sides Mixed Land Use	20 9.1%	24 4.1%	44 5.5%
	Three or More Sides Mixed Land Use	5 2.3%	6 1.0%	11 1.4%
	Total	220 100.0%	585 100.0%	805 100.0%

$\chi^2 = 12.169, p < .01$

Multivariate Analyses: Predicting the Odds of Burglary Victimization

The bivariate analyses indicated that few CPTED elements were statistically significant in relation to break and enter victimization. A logistic regression analysis was conducted to predict break and enter victimization for 805 properties, using garage, image and proximate land

use as predictors.⁷ The three variables were chosen because of significant relationships identified at the bivariate level. For the garage variable, the *no garage* category was chosen as the reference category when creating the dummy variable. For the upkeep variable, the *excellent* category was selected as the reference category. Finally, for proximate land use, the category of *all sides residential land use* was selected as the reference category.

A test of the full independent variable model against a constant only model demonstrates that both are statistically significant, which means both models would predict victimization outcomes. However, with the inclusion of the three predictor variables, the predictive power of the model is stronger ($\chi^2 = 33.743$, $p < .000$ with $df = 6$). A weak correlation exists between the predictors and break and enter victimization, with the full independent model explaining approximately six percent of the variability (Naglekerkes $R^2 = .059$). The constant only model only predicted burglaries 27.3 percent of the time, while prediction improved to 50.8 percent with the inclusion of the three variables (42.9 percent for non-targeted properties and 71.8 percent for targeted properties). While the predictor model demonstrates a moderately successful classification rate for burglarized properties, if one were to use this model to predict future victimization, it can be expected that there would be false positives. This means the three variables are not always sufficient in predicting burglary, because in some cases they predicted non-victimized houses as well.

All variables in the model were significant predictors of break and enters, except for those dwellings rated as average in terms of upkeep and those with only one side of the property that bordered mixed land use. The odds ratios for the three variables (e^{β}) indicate that those with an attached garage are two times more likely than those without a garage to be a victim of a

⁷Cases that had three or more neighbouring properties with mixed land use were regrouped with the category of two sides mixed land use. The new category captured properties with at least two of its borders adjacent to mixed land use. This was to ensure adequate case counts for each variable category input into the model.

break and enter. Likewise, those dwellings with a detached garage are two-and-a-half times more susceptible than those without a garage to be a victim of a break and enter. Dwellings that share at least two of their borders with other land use are two-and-a-half times more likely to be burgled compared to properties that are entirely surrounded by residential zoning. Finally, those properties rated as poor in relation to upkeep are approximately 2.8 times more likely than those properties whose upkeep is rated as excellent, to be a victim of burglary (Table 5.15).

Table 5.15: Estimated Coefficients of a Logistic Regression Model Predicting Break and Enter Victimization for Guelph in 2006 (N=805)

	Model		
	β	$SE \beta$	e^{β}
Access control measures			
Attached garage ^a	.698**	.208	2.010
Detached garage ^a	.902***	.257	2.464
Image measures			
Poor upkeep ^b	1.024**	.318	2.784
Average upkeep ^b	.180	.179	1.197
Territoriality measures			
One side mixed land use ^c	.331	.184	1.392
Two or more sides mixed land use ^c	.935**	.295	2.547
Constant		-1.873	
Log Likelihood		910.531	
Wald χ^2		61.268	
Pseudo R^2		.059	

a. Reference category is no garage.

b. Reference category is excellent upkeep.

c. Reference category is all sides are residential land use.

*** $p < .05$. ** $p < .01$. *** $p < .001$.**

Overall, the inclusion of the three variables significantly predicts break and enters for the sample. The presence of a garage, sharing at least two sides of one's property with non-residential land use, and having a dwelling that is poorly kept increases one's chances of being burglarized.

Chapter Six: Discussion

The findings from the last chapter identify the key predictors for burglary in Guelph, and the results demonstrate mixed support for CPTED as an effective crime prevention strategy. This chapter addresses the three research questions presented at the beginning of the study. The predictors of break and enters are discussed first, along with probable explanations as to why these are factors influencing burglary in Guelph. The second portion of the discussion is devoted to evaluating the efficacy of CPTED as a crime prevention strategy in light of the mixed support generated from the results. The third section focuses on the underlying theories of placed-based crime prevention strategies, namely rational choice and routine activities theory. Limitations of this study are also discussed.

What are the social and physical predictors of break and enters?

One of the primary thrusts of this study was to determine what physical and social factors increased household susceptibility to break and enters. As is evident from the regression analysis, only three key design features significantly predicted break and enters in Guelph. Dwellings with a garage, poor upkeep, and that bordered on mixed land use were more likely to be victimized. Each key predictor is connected back to other residential burglary research and consistencies or discrepancies are discussed.

Garage

As is evident from the regression analysis, the presence of a garage on the property was a significant predictor of break and enters. This finding is contradictory to what other researchers have discovered from site assessments and interviews with key stakeholders. Brown and Altman

(1983) for example, concluded from their site assessments that a garage was less likely to be present on a burglarized property. They speculate that a garage communicates an ambiguous sign of occupancy; offenders do not know if the homeowners are home or away because the vehicle(s) could be contained in the garage. This speculation is supported by more recent research focused on answering what particular cues burglars look for when they want to know whether a house is occupied. Snook, Dhimi and Kavanagh (2011) discovered from their interviews with 40 burglars that participants overwhelmingly identified the presence of a vehicle in the driveway as a sign of the dwelling being occupied.

Brown and Altman's (1983) study took place in suburban Salt Lake County, which they acknowledged eliminated the possibility of identifying strong predictors of burglary because of minimal demographic and/or zoning variability. Given their study was conducted approximately twenty years ago and in a suburban area, my contradictory findings can be attributed to architectural and spatial differences between their sample and mine. Guelph is a growing city with both contrasting historical and modern housing developments spreading outwards from the downtown city core. In this area, it is not unlikely that a garage could affect burglary differently, because there are other factors at work in a comparatively, more dense and modern city. Unfortunately, Brown and Altman's study is the only other study to date that has utilized site assessments to determine the effect that a garage has on burglary victimization. Other studies have opted for interviews with burglars, residents and police officers, but like the site assessment method, the results have been mixed. Cromwell et al. (1991) concluded from their ethnographies with 30 active burglars that the absence of a garage increased the likelihood of burglary.

Other studies which compared the perceptions of law-abiding citizens versus burglars found incongruence between participant responses to environmental cues that were judged to

make a house more vulnerable to burglary. Shaw and Gifford (1994) compared what residents perceived as making houses vulnerable to burglary against burglars' perceptions from an earlier study (Macdonald & Gifford, 1989). Ham-Rowbottom et al. (1999) also utilized Macdonald and Gifford's (1989) findings to compare burglar judgments against police officer perceptions of house vulnerability. The compilation of three different studies which used judgments from different stakeholders but the same methodology allowed for interesting comparisons. Both resident (Shaw & Gifford, 1994) and police officer (Ham-Rowbottom et al., 1999) participants judged photos of houses with garages to be less susceptible to burglary. When both studies each compared the judgments of their participants against the judgments of burglars, the correlations between law-abiding perceptions and burglars were weak to moderate. The presence of a garage did not significantly correlate with vulnerability assessments made by burglars (Macdonald & Gifford, 1989), whereas it did for residents and police officers.

The small collection of interview studies which assess the presence of a garage indicate that this environmental cue is inconsistently interpreted by burglars as either a precipitating or mitigating factor in relation to break and enters. Thirty active burglars consider it a mitigating factor (Cromwell et al. 1991) which is similar to some law-abiding citizens (Shaw & Gifford 1994; Ham-Rowbottom et al., 1999), while 43 convicted burglars demonstrate that it is an environmental cue which is not significantly relevant to determining the vulnerability of a house (Macdonald & Gifford, 1989). What is evident from the handful of studies that directly examined the presence of a garage, along with my current findings, is that more work must be done to understand exactly what a garage means to burglars who are at the point of deciding which dwelling would be a suitable target. Based on my results, I offer two possible explanations as to why the presence of an attached or detached garage actually made properties more susceptible to

break and enters in Guelph. Hopefully, this speculation will direct future research and help make clear the contradictory findings thus far.

Firstly, while Brown and Altman qualify a garage as an ambiguous symbol of dwelling occupancy, I argue it can be considered an entry point. With respect to occupancy, Armitage (2011) highlights that even in developments where the driveways are intentionally short to encourage residents to park in the garage, residents still park in the driveway. She argues that this is the case because most residents can keep an eye on their car, but also because it is convenient to access. While I cannot confirm that this is the behaviour of Guelph residents, it does raise an important point. If residents refrain from parking in their garage, then it may not be as strongly connected to perceptions of occupancy as Brown and Altman (1983) suggest, simply because the car is located in the driveway all the time. Instead, a garage can present additional doors or windows that enable access to the interior of the garage and, if attached to the dwelling, provide an additional access point into the house.

Garages have main doors that are either manually or automatically opened with a switch, often have a side door entrance as well as an access door to the house from the interior of the garage (if the garage is attached to the house). These provide new access points for burglars, rather than entering through the front door or a window. Homeowners may not be as diligent in ensuring that these garage access points are secured, meaning burglars could enter through the garage and into the house. Finally, homeowners may use garages for storage of goods in combination with parking their vehicle. Recent research from the United Kingdom demonstrates that residents tended to use their garages for storage, rather than parking their vehicle (Armitage, 2011). The potential for property that burglars may find valuable is now located in an arguably, more accessible space.

These two explanations are speculative and require further research. However, either of these explanations or a combination of the two can account for the differences between Brown and Altman (1983), Cromwell et al. (1991) and my current findings. My findings are the first in the field that I know of that provide contradictory site assessment results for the relationship between a garage and dwelling victimization. The differences can be explained by methodological differences such as the geographical area from where my samples were drawn (suburban county versus urban city), or differences in sample size (306 properties versus 805 properties). Additionally, the differences could signal that garages are considered points of access or have valuables within. More studies should extend what researchers did in the 1990s; using interviews with burglars to assess whether or not the presence of a garage is a deterrent or an attractor variable, and explicitly determine what it is about a garage that influences a burglar's decision to act.

Upkeep

Similar to the presence of a garage, a dwelling's upkeep was significantly associated with break and enter victimization. My sample of only burgled houses did indicate that average and excellent looking houses were targeted more than poorly kept dwellings. I argue that this distribution is a reflection of Guelph being a relatively affluent city, which means well kept houses are disproportionately present across the city. However, when comparing the two sub-samples of burgled and non-burgled samples in my study, the results demonstrate that poorly kept houses are often more likely to be victimized.

This finding is not surprising as upkeep, maintenance or image (the terms are often used interchangeably) is a main principle of CPTED, wherein proponents advocate keeping properties

well kept. Newman (1972), for example, argued dwellings that were well maintained or well kept by residents were correlated with reduced crime. Schneider and Kitchen (2002) correctly point out that Newman's argument laid the foundation for Wilson and Kelling's (1982) broken windows theory, which posits that visible signs of physical disorder lead to more disorder and crime. This argument was supported in later work by Skogan (1992). St. Jean (2007) comments on signs of physical disorder being both indirectly and directly connected to crime. Physical disorder is indirectly connected to crime because it instills apprehensions or fears in local residents, which in turn causes residents to exert less informal control over the space, allowing more crime to flourish (St. Jean, 2007). While Wilson and Kelling (1982) argue physical disorder signals to offenders that no one cares about the area, St. Jean (2007) concluded the physical disorder in residential areas is interpreted by offenders as residents' personal struggles with income. From St. Jean's (2007) perspective, offenders are sympathetic towards those who live in dilapidated houses; however, the results from this study do not support his sentiment. While the results here do not speak to whether break enters occur directly or indirectly because of physical disorder, they nevertheless indicate that poorly kept houses are related to levels of burglary victimization, suggesting that physical disorder may precipitate break and enters.

Another explanation for the findings could be that poorly kept houses are indicative of low-income households which cannot afford adequate security measures to prevent victimization. While I did not directly assess the value of each property through housing records, other researchers have demonstrated that the image of a dwelling is often connected with the perceived value of the home (Bennett & Wright, 1984; Rengert & Wasilchick, 1985; MacDonald & Gifford, 1989; Brown & Bentley, 1993). Wright et al. (1995) even used indicators

of upkeep for participants to evaluate whether dwellings were poor or wealthy.⁸ The interconnectedness is based on the explanation that wealthy homeowners are more likely to take pride in their property and be more invested in its appearance than homeowners who are poor (Macdonald & Gifford, 1989). This explanation is expanded by the work of Tilly (2011) who compared the presence of security features for houses in different income brackets in both England and Wales. Tilly (2011) concludes that the highest income level dwellings are more likely to have enhanced security measures and less likely to have less than basic security measures when compared to those dwellings in the lowest income bracket. Again, although my study did not assess property value, other research has shown image is related to perceived wealth. Therefore, there are two possible explanations which can account for the findings here. First, poorly kept houses may signal to burglars that no one cares if a crime is committed, while also reducing residents' willingness to intervene. Second, it is possible that the burgled dwellings in my sample that were rated as poorly kept were less likely to have sufficient security measures to prevent victimization, unlike those homeowners of well kept houses who had the financial means to employ preventative measures to protect their dwelling. More research that combines measures of target hardening employed by homeowners would begin to clarify the suggestive results here.

Proximate land use

While the first two predictor variables are directly connected to the characteristics of the victimized dwellings, the third focuses on the dwellings' immediate geographical areas. As part of the site assessments, neighbouring land use was noted for each property. Dwelling

⁸ Wright et al. (1995) use features such as an overgrown yard and peeling paintwork to infer negative wealth of the dwelling, whereas a well kept house is associated with positive wealth.

victimization in Guelph was predicted by neighbouring land use. According to the predictive model, homeowners who shared at least two sides of their property with industrial, institutional, commercial, roadways or undeveloped land were more likely to be victimized than properties surrounded entirely by residential land use. Thus, houses that were victimized tended to be located in areas with mixed land use. I offer two possible explanations as to why this finding is significant. The first discusses the implications that mixed land use has on residents' perceived levels of territorial control over their local space. The second focuses on the purpose of non-residential land use which typically brings more unknown pedestrians and users into those particular geographical areas, compared to residential areas. Consequently, these areas can attract potential offenders, thereby increasing their awareness of suitable dwelling targets in those areas.

Areas such as businesses, stores, schools, parks, major roadways or undeveloped land are, by their very nature, intended to serve a variety of people and allow those people to make use of the space. However, sharing such space arguably decreases the amount of control or territoriality one exerts over the space. Taylor (1988) comments about how land use and zoning can hinder residents' abilities to exert control or influence over the immediate geographical space. According to him, both increased pedestrian and vehicular traffic can hinder territorial concern amongst residents and actually cause residents to retreat into their homes. This increased traffic is expected in non-residential areas, because schools, parks and shopping centres etc., are designed to serve many people. Taylor (1988) argues more unknown users in a space makes the local residents perceive they have less control over the area, because the residents feel the area does not belong to them. This is evidenced by research that demonstrates territorial control among residents is less on borders and zoning gaps of residential developments, because strangers occupy those areas more (Merry, 1981; Perkins et al., 1992).

The level of territoriality or social control exhibited by residents in *entirely* residential areas is different, especially if most homes are owned and occupied by the same residents for long periods of time (Taylor, 1988). Compared to an area with mixed land use, residential areas provide the opportunity for more territorial behaviour because residents continually interact (albeit even passively) with other residents, begin to recognize each other and can eventually develop acquaintance relationships (Taylor, 1988). This social process enables residents to feel more comfortable in their immediate residential area because they know, to a certain extent, who belongs and who does not. This foundation leads to feelings of responsibility and care for residents' local areas. However, as Merry (1981) points out, *entirely* residential areas are not sufficient in predicting increased territorial behaviour; control is moderated by social conditions of the area as well. A discussion of the social conditions that contribute to strong feelings of territoriality amongst local residents is beyond the scope of this study, however.

The potential weakening of territoriality among residents has implications for those who advocate for mixed land use. Jacobs (1961) advocated for "eyes on the street," meaning that an effective way to deter disorder and crime was to organize urban developments so that consistent opportunities for natural surveillance over the city streets were possible. She argued this could be accomplished by spatially integrating both residential and non-residential land use (Jacobs, 1961). Jacobs did not discriminate between the types of people who can provide natural surveillance; strangers and outsiders were equally effective as residents. Jacob's mixed land use suggestion is contemporarily represented in the modern urban planning movement called New Urbanism. New Urbanists are intent on developing a sense of community by designing areas with diverse land uses that are within walking distance (Kim & Kaplan, 2004). According to Talen (1999), New Urbanists attempt to accomplish this by integrating private dwellings and

surrounding public space, while ensuring the surrounding public space is strategically placed and designed to foster the sense of community. She argues that the juxtaposition of houses with mixed land use promotes walking, lingering and multipurpose spaces where individuals from various social, economical and cultural backgrounds are likely to encounter one another, fostering social interactions and the integration of people (Talen, 1999).

There is an evident contradiction between Taylor's (1988) notions of territorial functioning amongst individuals and communities, and the sense of community that new urbanism purports is possible through mixed land use. The former asserts that gaps in residential land use mitigate territorial behaviours, while the latter argues that gaps and a mixture of activities will increase sense of community and thus encourages residents to take ownership over the area (Kim & Kaplan, 2004). While the results here cannot state clearly that mixed land use inhibits homeowners' abilities to exert a sense of proprietorship, they do demonstrate that burglaries were more likely in areas with mixed land use. This means that territoriality can be a factor and it calls into question whether intermixing land uses is an effective crime prevention tactic supported by New Urbanists.

The second explanation offered for the greater likelihood of burglaries in areas with more non-residential land use is that burglars commit break and enters in areas they are familiar with. It is generally accepted that crime is unevenly distributed in time and space, and amongst offenders and victims (Johnson et al., 2007). This uneven distribution of victimization is influenced by an offender's awareness of potential spaces to commit crime (Brantingham & Brantingham, 1984; 1993). For example, an entire area of poorly secured houses could be present in Guelph, but if no one knows about it, this collection of houses will not be burgled.

A key consideration in victimization then becomes offenders' awareness of areas or spaces and targets they consider desirable and/or vulnerable. Crime pattern theory posits that offenders develop an awareness of space in their cities by performing other legitimate and illegitimate activities (Brantingham & Brantingham, 1984). Brantingham and Brantingham (1993) remind us that criminals spend most of their time engaged in non-criminal or legitimate activities, thus legitimate activities enable offenders to develop awareness of areas that they might consider desirable for committing illegal acts. For instance, the paths they take to the grocery store, work, friends' houses, and parks, all contribute to their growing awareness of the space they operate in, as well as exposing them to potential targets.

Likewise, burglars who are looking for targets are likely to travel known areas first. Brantingham and Brantingham (1993) equate the target selection process of a burglar to the process of someone trying to find a gas station. Typically, when gas is needed, individuals will proceed to a station they know if they are in the area, or else will embark on a search looking for areas indicative of gas stations. Burglars employ a similar method, wherein they search or operate in areas they know, or have developed an awareness of. The subjective knowledge of geographical space that individuals develop is often referred to as a cognitive map (Downs & Stea, 1977), and these are different for every individual depending on their typical use of areas. The crux of crime pattern theory is that crimes will occur where an offender finds suitable targets within their own awareness space or cognitive map. Support for crime pattern theory is evidenced in studies of offender mobility, which show that offenders typically commit crimes close to a geographical anchor point (Rengert, Piquero & Jones, 1999) and that exploratory behaviour is not common (Maguire & Bennett, 1982; Rengert & Wasilchick, 2000). Lersch and

Hart (2011) argue that one of the reasons offenders operate close to anchor points is because their cognitive maps are more developed or familiar for proximal rather than distal areas.

An important question from my findings is whether non-residential land uses function as areas where burglars operate legitimately and subsequently help them develop an awareness of nearby target homes. I cannot say for certain that this is the reason for the increased victimization of houses adjacent to non-residential land use, but based on crime pattern theory, it is likely that dwellings adjacent to malls, schools, parks and major roadways, for example, have an increased likelihood of being considered viable targets from a burglar's perspective.

Overall, out of the 11 variables designed to assess victimization that were based on four core CPTED principles, only three variables successfully predicted burgled properties from non-burgled properties. While one can use the three predictors to help develop safeguards against victimization, there remains the issue of addressing why the other design features did not predict burglary victimization. I now turn to a broader discussion about CPTED based on the four core features that I assessed; access control, natural surveillance, image and territoriality.

What do the results infer about the efficacy of CPTED as a crime prevention strategy?

It has been almost 40 years since the early CPTED-type discussions were first seen in the crime prevention literature, starting with Jacobs (1961) and her recommendations for mixed land use to promote natural surveillance. Since then, Jeffrey (1971) developed a comprehensive CPTED approach, while Newman's (1972) defensible space theory became the more widely accepted approach that modern CPTED was based on (Cozens, 2005). Shaftoe (2004) argued that Crime Prevention Through Environmental Design proved an attractive approach to crime prevention because of its simplistic explanation that crime could be abated by redesigning spaces

according to a few key principles; however, CPTED has been widely criticized. Most objections to CPTED focus on its environmental determinism (Shaftoe, 2004), the possible temporal and spatial displacement of crimes (Schneider & Kitchen, 2002; 2007), inadequate definition of key principles (Ekblom, 2011), methodological concerns with CPTED-related studies (Eck, 2002), and the ability to generalize successful CPTED initiatives to other cultural or social areas (Schneider & Kitchen, 2007).

Despite uncertainty surrounding the effectiveness of CPTED, Schneider and Kitchen (2007) argue that large scale CPTED initiatives have been undertaken, such as new urbanism or gated communities, without solid empirical support for doing so. They argue these types of initiatives persist, even though there is little hard evidence to support or refute the effect that design features have on crime (Schneider & Kitchen, 2007). Eck (2002) agrees with the sentiment that it is difficult to know exactly what works with CPTED. He argues that much of the uncertainty is due to methodological issues which plague evaluative studies of place-based prevention initiatives. Even though Eck (2002) considers the classic controlled experiment setting to be the pinnacle of research design, he rightfully concludes from his sweeping review of CPTED type reports and interventions that only approximately one third of the evaluations had a control group and researchers usually did not report significance levels for any observed crime reductions in the area. My study attempted to rectify some of these prior methodological shortcomings while contributing solid empirical evidence related to the efficacy of CPTED. Although I did not measure directly crime rate fluctuations, I did have an adequate comparison group of non-burgled houses, which provided the ability to contrast what physical features made burglarized dwellings more susceptible.

Based on the findings of the site assessments in this study, some CPTED design principles appear to be associated with reduced victimization, while others remain unknown. As has already been discussed, there are three key indicators of burglary. Those three indicators show some support for the CPTED elements of access control, image and territoriality, but none related to natural surveillance.⁹ First, I discuss the effectiveness of each CPTED principle as evidenced by the design features assessed in the study. Afterwards, I turn to a broader discussion about the shortcomings of assessing the effectiveness of CPTED, drawing on critiques and my own study to show how complex this crime prevention strategy is to assess and implement.

For access control, most variables did not significantly relate to a dwelling's burgled or non-burgled status (with the exception of a garage). Even though garage was associated with burglary, it is not often associated with access control in the CPTED literature.¹⁰ I opted to consider it a measure of access control because of the multiple entry points a garage provides for potential burglars. Therefore, there may be some support for access control as a relevant principle in helping to deter burglary, but without being able to assess how secure each entry point was, the presence of a garage can neither deny nor confirm access control as an effective prevention principle.

A notable non-finding was the homeowners' use of symbolic and physical barriers to define their properties and limit access (whether actual or perceived access) to passersby. Brown and Altman (1983) concluded from their site assessments that non-burglarized houses often had more actual or symbolic barriers on their property. More recent research in England supports the

⁹ Access control was represented by the variables: garage, shed, front/back division, barriers and access street type. Natural Surveillance was represented by the variables: setback, house visibility from the road and front door visibility from the road. Image was solely represented by the variable: upkeep. Territoriality was represented by the variables: corner lot and proximate land use.

¹⁰ Armitage (2011) discusses garages under the principle of surveillance, and how they influence homeowners' abilities to effectively keep watch over their vehicle.

notion that actual and symbolic barriers significantly reduce the risk of break and enter (Armitage, 2000). However, as with other CPTED principles, the empirical support for barriers is mixed. Other site assessment research has concluded that symbolic barriers did not significantly reduce serious crime, such as break and enters (Perkins et al., 1992). Interviews with burglars demonstrate that the presence of barriers seemingly has no affect on their decisions to burgle (Macdonald & Gifford, 1989). In fact, recent research seems to suggest the presence of physical barriers can increase the likelihood of victimization because of the opportunities these features provide for concealment (Coupe & Blake, 2006, Cromwell & Olson, 2011).

Considering the mixed results from past research regarding barriers, the null findings in my study are not surprising and can be attributed to both individual preferences of burglars, but also the multiple functions that barriers can serve. Maguire and Bennett (1982) assert that some burglars choose targets because they have sufficient cover, such as fences, bushes and trees. Conversely, some burglars mentioned that trying to sneak around and act suspicious could actually draw more attention. Therefore, despite there being adequate cover, burglars confidently walk to the rear of a house, which to onlookers might appear as if the burglar was a friend, homeowner or someone who legitimately belongs on the property (Maguire and Bennett, 1982; Cromwell & Olson, 2011).

This points to how design features can have adverse effects (Cozens et al., 2001; Ekblom 2011), such as mitigating a break and enter, precipitating it, or not affecting the situation at all. While homeowners may erect physical barriers around their property to keep outsiders out, they also effectively reduce the opportunities for natural surveillance by onlookers. The extant literature and results presented here demonstrate that barriers also remain, at this point, an unclear indicator of how effective preventing access to others can be in reducing burglary.

The variables designed to measure natural surveillance provided no clear support for its efficacy as a CPTED design principle. One explanation as to why natural surveillance variables were not related is modern housing developments are more similar in architectural design and features. Houses have standard setbacks from the road and the close proximity of units does not provide much room for excessive foliage that would hinder surveillance. In essence, everyone can more readily view each other in these more modern developments. However, a more persuasive explanation is that natural surveillance requires *both* physical opportunities and residents who will act on what they see. Based on past research, I argue that unlike the physical opportunities for surveillance, the propensity of individuals to act is not as consistent.

Some research suggests that burglars are aware of being seen and that they judge houses that are highly visible as less vulnerable to break and enter (MacDonald & Gifford, 1989; Coupe & Blake, 2006; Cromwell & Olson, 2011). However, other burglars have indicated they expect to be seen by onlookers and counter this by acting confident and pretending to have a purpose for being at the target dwelling (Cromwell & Olson, 2011). These responses from burglars demonstrate that they are not as concerned with natural surveillance as they are with residents taking action when they see the burglar committing a crime. Unfortunately, research in the field of social psychology indicates that intervention from an onlooker is less likely when the individual thinks that other onlookers will act. Darley and Latane (1968) explain bystander intervention phenomenon as a process called diffusion of responsibility. They argued that if an individual knew or believed many people witnessed an event, that individual would be less likely to intervene in what he or she saw. Fischer et al., (2011) conducted a meta-analysis of the bystander intervention research from the 1960s until 2010 and concluded that the bystander

intervention effect is comparatively greater for non-emergency situations without a perpetrator than it is for emergency or dangerous situations where a perpetrator is present.

Based on social psychology research, residents or onlookers must first interpret a burglar on another's property as an emergency to be more likely to intervene. As was noted prior, some burglars go to great lengths to appear to others as though they belong on a property (Cromwell & Olson, 2011). Even though not all burglars employ disguises, those actions of burglars who simply check for unlocked doors may be ambiguous to onlookers. Those individuals may interpret the situation as a non-emergency and subsequently do nothing about it.

In sum, the natural surveillance is not supported by my findings, to which I argue, is explained by the bystander effect introduced in social psychology field in 1960, which has received considerable empirical support. Since my method could not assess the social or human component of natural surveillance, I am unable to conclude if natural surveillance is an effective design principle or not. Unlike natural surveillance which was not supported here, the CPTED element of image was supported.

Newman's (1972) original concept of image and its relationship to crime is incorporated mostly into modern CPTED principle of image. What is missing is his argument that image reflected the neglect and stigmatization of those less fortunate, by the broader society. The image principle is supported by my results and coincides with some prior research assessing image and its impact on victimization. However, other studies contest that routine maintenance and a respectable image can actually be related positively to break and enter victimization.

Past research has shown that regular upkeep or maintenance of areas can help reduce drug dealing (Eck, 1998), graffiti (Sloan-Howitt and Kelling, 1990) and other crimes. Breaking and entering however, demonstrates how CPTED design features can have different affects on

different types of crime. Upkeep, for example, can signal two messages to burglars: first, upkeep might suggest the area is well cared for by the homeowners who may therefore assume control over their properties, which is consistent with my findings (Wilson & Kelling, 1982; Taylor, 1988). Second, well kept houses are desirable targets because they may contain more valuables (Bennett & Wright 1984; Shaw & Gifford, 1994; Cozens et al., 2001). This notion is supported by Cromwell and Olson (2010) who argue that most offenders are motivated to commit burglary so they can buy drugs, alcohol, or other items. Burglars assess the potential reward based on the affluence of the neighbourhood, the size of the house and, among other features, the maintenance of the property (Cromwell & Olson, 2010). This demonstrates the complexity of this CPTED feature; residents feel that a well kept house sends one message, when in fact it can be interpreted differently by some burglars. The collection of literature that discusses the effect of image on burglary demonstrates that this design principle can either mitigate or precipitate victimization.

As with access control, there are contradictory explanations for the affect that image has on break and enters. A dwelling's positive image signals to burglars that there are likely valuables to be stolen, while also communicating the message that homeowners care about their residence. I argue that a positive image increases *both* perceived gain (potential property to steal) and perceived risk (increased chances of being challenged by residents). For some burglars the gain is perceived to outweigh risks, while for others a well kept house signals certain intervention by security measures or the homeowner.

The final design feature assessed is arguably the most controversial because the concept of territoriality is difficult to define, measure directly, and arguably overlaps with other CPTED principles (Cozens et al., 2005; Ekblom 2011). Newman (1972), who originally coined the term,

was vague in his explanation as to what territoriality meant and how residents could best practice it. This lack of a clear definition has led to subsequent definitions of territoriality, such as personalization of places or objects (Brown & Altman, 1983), symbolic communication about one's identity (Brown & Bentley, 1993) creating a space of influence (Crowe, 2000) and a sense of ownership or proprietary concern (Cozens et al., 2005). To complicate the definition further, researchers point out that access control and natural surveillance (Crowe, 2000) and occupancy of dwellings (Brown & Bentley, 1993) contribute to a sense of territoriality. What is evident from this brief collection of definitions is that territoriality is a complex CPTED principle; often difficult to define. With its inconsistent and vague definitions it is not surprising that territoriality has been measured differently. Different researchers have used different variables to infer territoriality, and consequently have produced varied results (Brown & Altman, 1983; Brown & Bentley, 1993; Ratcliffe, 2003) or do not (Bennett and Wright, 1984; Macdonald & Gifford, 1989; Perkins et al., 1992).

My findings do suggest *some* support for territoriality as an effective design principle. I chose to assume that areas of greater pedestrian traffic and unknown users would hinder residents' willingness to exert informal control over the space. However, without actual discussions with the residents of those areas, I cannot confirm that territorial behaviour is an effective deterrent against break and enter victimization.

Taking into consideration the results for the four CPTED principles assessed here, I argue there is reason to be cautiously optimistic about CPTED as a crime prevention strategy. For most of the design principles in my study, the results are merely suggestive. This is due to study design, but also reflects the complexity of CPTED and its principles. Ekblom (2011) argues that much of the empirical support for CPTED is mixed because of significant problems with the

definition of CPTED itself, but also its main design principles. He points out correctly that effective definitions are the basis for subsequent accumulation of evidence, knowledge and theory. Ekblom's argument about insufficient definitions and measurement, I argue, is why Eck (2002) reports that it is difficult to know what works in preventing crime. If we hope to gain better insight into what works when it comes to designing out crime, the research community needs to first revisit the foundational definitions of CPTED and reach some form of consensus regarding its main design concepts. If consistent definition and operationalization of CPTED principles could be established, researchers would be in a better position to compare and contrast results. I recommend that proponents of CPTED follow Ekblom's (2011) lead and return to the drawing board and reconstruct the foundation of this place-based prevention strategy. This step has not yet been done. Rather, researchers seem to work new CPTED principles into the existing framework. For example, Saville and Cleveland (2003) introduced second generation CPTED, which focuses on the social characteristics of neighbourhoods and how those can be utilized along with physical design to prevent crime. They include concepts of community culture, connectivity, threshold and social cohesion as important principles of crime prevention (Saville & Cleveland, 2003). I opine that Saville and Cleveland's introduction of second generation CPTED is not a worthwhile endeavour because it is ultimately predicated on a prevention strategy that is in need of re-examination. Social factors could prove valuable in CPTED, but their inclusion should be developed from the beginning along with physical factors, rather than being tacked onto the strategy in a retrospective fashion. Ekblom (2011), fortunately, has provided researchers with an opportunity to stop, step back and critically assess CPTED from the ground up.

Of course, questioning the fundamental characteristics of CPTED is likely to be met with considerable opposition. Parnaby (2006) asserts that urban planners, architects, law and security officials and researchers continue to praise this strategy as an effective deterrent to crime. Moreover, those who have built careers around being CPTED experts have a vested interest in continuing to promote its relevance and effectiveness, even though research suggests its effectiveness is not unequivocally demonstrated (Parnaby, 2006). Should CPTED's inconsistencies and shortcomings become widely known, the careers and perceived legitimacy of CPTED experts would be threatened.

I am not suggesting that all CPTED proponents are unable to be critical of CPTED principles, but I agree with Schneider and Kitchen (2002) that CPTED's use has been partially based on opinion rather than independent, empirical research. The optimism that I mentioned earlier stems from the research that demonstrates there are design features that seem to work. I remain cautious, however, because research moving forward must be cognizant of the complexity of CPTED and its potential long term side effects. Parnaby and Reed (2008), for example, remind us that place-based crime prevention strategies often suppress the social imbalances of power that exist in our communities. Design principles such as natural surveillance may serve to exacerbate already established social, cultural, gender and financial inequalities that exist between groups.

Likewise, tendencies of homeowners to use physical barriers and secure their properties can have the unintended effect of residents distancing themselves from the community; this has been witnessed with gated communities, for example (Schneider & Kitchen, 2002; 2007). Some residents have moved to gated communities because they fear crime but also cultural changes in their neighbourhoods; physical barriers offer an opportunity to feel safety once again (Low,

2001). However, Sanchez et al. (2005) conclude from their research that gated communities are often occupied by individuals from a wide variety of ethnic and socioeconomic statuses living in rental properties. Moreover, reasons of security or status were not identified significantly as motivating factors for residents to move into a gated community. This research challenges the notion that gated communities are only for those in high socioeconomic brackets, however, gated communities still provide the opportunity for residents to supplant social confrontation and interaction with physical walls and barriers.

Researchers evaluating CPTED must first address its theoretical foundation and the inconsistent definitions, measurement and interpretation of its key concepts. This step may position researchers in a better position to discuss what physical features do and do not prevent or deter crime. Moreover, there needs to be a more concerted effort among CPTED proponents to consider the long term social effects associated with place-based crime prevention strategies.

How do the findings speak to CPTED's foundational theories of rational choice and routine activities?

Despite mixed support for CPTED as an effective prevention strategy, the results support rational choice and routine activities theory to a certain extent. The discussion here focuses first on rational choice and its major critiques, followed by how the results relate to routine activities theory.

The Rational Choice Perspective

At the centre of the rational choice perspective is the classic argument put forward Clarke and Cornish (1986), which is a motivated offender who economically weighs *all* the costs versus

the benefits of committing a crime. While rational choice encompasses a wide variety of decision-making processes related to criminal careers, it is the decisions an offender makes to engage in a particular crime that relate directly to CPTED (Lersch & Hart, 2011). The findings from this study and prior research seem to suggest that the depiction of a burglar as a decision maker, attentive to relevant environmental cues, is likely (Mawby, 2001).

The image of a burglar as a rational actor is not surprising because burglary is a property crime which burglars hope to obtain tangible benefits, unlike violent crimes where the benefits are not as easily understood for those other than the offender. De Haan and Vos (2003) argue that rational choice is inherently better suited for crimes that are instrumental in nature, meaning there are tangible benefits to be had. Break and enters are an instrumental crime, because the property stolen is used to perpetuate an offender's lifestyle. For example, Cromwell & Olson (2011) highlight drugs and a luxurious lifestyle as reasons mentioned by burglars for committing break and enters.

Several researchers argue that rational choice neglects emotions, norms and values that can be present during the decision making process, and that this commonly misrepresents criminals as calm, collected and purely rational when they make their decisions (Scheff, 1999; De Haan & Vos, 2003). Cromwell et al.'s (1991) staged activity analysis with burglars clearly demonstrates this point. Burglars visited past sites of break and enters and were asked to explain how they committed their act, including what decisions they made. The researchers noticed that burglars exaggerated the planning stages of the crime, but when interviewed later, admitted that their planning was not as extensive as they originally suggested. Cromwell et al. (1991) called this "rational reconstruction," meaning individuals tend to rationalize their actions after the fact.

Regardless, even though the planning was not as extensive as the burglars originally suggested, Mawby (2001) argues that those results are indicative of a limited rationality explanation.

The concept of limited or bounded rationality is an important criticism leveled against the traditional rational choice perspective. Shover and Honaker (1992) argue offenders can be considered *rational*, even if their conceptions of risks and rewards differ from law-abiding citizens. Research has shown burglars and residents often do not agree when it comes to selecting relevant environmental cues (Shaw & Gifford, 1994; Wright, Logie & Decker, 1995). Bounded rationality assumes that no offender can know *all* of the relevant knowledge related to the crime. Unlike Becker's (1968) traditional depiction of offenders as economical decision makers, bounded rationality concedes that purely rational decision making is not possible, and that certain levels of emotion, uncertainty, and gut feelings are part of the decision making process (De Haan & Vos, 2003). Snook, Dhimi and Kavanagh (2010) argue that the bounded rationality is now generally accepted in relation to burglary, based on corroborating evidence derived from ethnographies and interviews with those who commit break and enters. Research demonstrates that burglars use search strategies, are attentive to some environmental cues and employ heuristic strategies (Bennett & Wright, 1984; Coupe & Blake, 2006; Nee & Meenaghan, 2006; Snook et al., 2010). These are indicative of individuals who exhibit some level of rationality.

Focusing specifically on my results, the significance of upkeep/image suggests that poorly kept houses may indicate lower perceived risks for a burglar as opposed to well kept houses. Without actual offender interpretations, however, my results are merely suggestive. Cozens et al.'s (2001) interviews with burglars showed that burglars judged poorly kept houses to be more associated with crime and an unwillingness amongst residents to intervene. Implied in

these comments is that the risk of being caught committing a break and enter is low compared to well kept houses which, although might involve a better take, are judged to be more risky because of the care the homeowner displays.

The rational choice perspective has drawn its share of criticism; however, the growing body of research regarding burglars and my results suggest a rational offender who engages in a bounded decision making process while committing a crime. However, bounded rationality is not useful from a crime prevention standpoint, because it means decisions are highly context dependent and subjective. It becomes difficult, if not impossible to discern what elements will increase perceived risk and what will decrease perceived gain.

Routine Activities Theory

Initially, Cohen and Felson (1979) developed their theory to explain post-war social migration patterns and how they related to increased crime rates. During this time, families had more financial wealth to buy new electronics, suburban developments pulled families away from city centres and commuting to places of work left homes unattended during the daytime. The combination of spending power and unattended homes during the day left homeowners vulnerable to break and enters. Based on crime statistics and the migration patterns of families, Cohen and Felson argued if three conditions occur simultaneously in time and space, crime will occur. The presence of a motivated offender, a suitable target, and the absence of guardianship has been supported by recent research (Coupe & Blake, 2006; Yule & Griffiths, 2009).

The results here provide some support for routine activities theory (Cohen & Felson 1979), insofar as almost three times as many weekend burglaries occurred during the nighttime, as opposed to weekday burglaries. Daytime burglaries are evenly distributed between the

weekdays and the weekend. The nighttime burglary distribution is likely because on weekends families and individuals are away from their house during the evenings or are asleep. The split of daytime and nighttime burglaries during the week does not fully support routine activities. Based on the theory, I would expect to find burglary occurrences more heavily distributed among daytime hours, similar to Coupe and Blake (2006).

The finding that mixed land use increases a homeowner's likelihood of being victimized can also be explained by routine activities theory. Reynald and Elffers (2009) argue routine activities are also associated with places. Depending on the purpose of the space, different individuals will occupy it and perform different activities. Researchers have debated the affect that increased human movement or traffic has on crime. Some argue increased pedestrian traffic which is present in particular settings can provide effective surveillance (Jacobs, 1961; Hillier & Shu, 2000), while others argue that more accessible areas are associated with higher levels of crime (Brantingham & Brantingham, 1984; Johnson & Bowers, 2010). Crime is therefore not dependent on how many people use an area, but rather what activities occur in that area and how that affects the sense of guardianship among others to protect that space. My results would show that mixed land use increases the likelihood of burglary possibly because local residents feel less inclined to act as guardians. Of course, how guardianship is exercised in these areas is a matter for further exploration. Overall, daytime and nighttime variations of break and enters and increased victimization of dwellings located close to other land uses lends some support to routine activities theory.

Rational choice and routine activities theory underpin CPTED and, as such, there is considerable overlap between them and the concepts they discuss. It is possible to see the theoretical linkages between perceived risks and guardianship, and also perceived gain and

suitable targets. Moreover both the rational choice perspective and routine activities theory assume a motivated offender. However, with the recent theoretical critiques of rational choice and the introduction of bounded rationality, that perspective's usefulness is less, compared to routine activities theory.

Limitations and Future Research

The methods used in this study were somewhat limited and, as such, future directions for new research would help extend our understanding of physical design and its relationship with break and enter victimization. The first drawback relates to the physical design of many of the houses in Guelph. Many of the city's residential developments (particularly in the southern end of the city) are comprised of dwellings that are similar in size and features. Some of the null findings (particularly natural surveillance) could be attributed partially to having a comparison group in the sample with physical design features resembling dwellings that were burgled. A study within a city that has a wide variety of housing features, such as garages, setbacks, visibility and so forth would better identify which physical design features are related to burglary, but would also identify whether modern housing developments are rendering some CPTED principles (natural surveillance for example) irrelevant when it comes to break and enters.

Second, although Google Earth was an efficient and inexpensive tool to conduct site assessments, if time and funding permitted, actual site visits would allow for more details to be recorded, and would enable researchers the opportunity to assess properties during the similar time frames to when they were burgled (i.e. assess a night time burglary at night, rather than during the daytime). This would put researchers in a better position to assess whether lighting,

barriers or image for example, affect a burglar differently in daylight or darkness. Moreover, aerial photos of Guelph and street-level photos were taken in 2006 and 2009 respectively. This means that homeowners could have altered their property from what it looked like when the burglary occurred.

The results from the study, for the most part, are suggestive. The design features that are related to burglary victimization require follow-up, using interviews and ethnographic studies with victims and burglars to illuminate how these physical features are interpreted by these groups of individuals. Combining site assessments of a burgled and non-burgled sample with in-depth interviews would help to further develop the causal linkages that lead to break and enters and enable researchers to provide recommendations for CPTED moving forward.

Chapter Seven: Conclusion

This study's main purpose was to use existing place-based crime prevention theories to better understand what factors increase a homeowner's chances of being burgled. In addition, the data provided points of discussion for the utility of CPTED and its foundational theories of rational choice and routine activities. Although few factors appear to be associated with increased chances of break and enter victimization, each predictor variable was significantly related to break and enter victimization.

The presence of a garage on the property increases its chances of being burgled. I argue that this environmental cue has less to do with the perception of dwelling occupancy and more to do with providing additional entry points for burglars. A dwelling's poor image also increases the chances of the homeowner being a victim of a break and enter. Based on prior research, offenders are apt to perceive well kept houses as more defended by their residents, whereas there is less perceived risk with poorly kept houses. Additionally, it could be the case that a poorly kept house is indicative of low-income dwellings which are unlikely to afford effective alarm systems and defensive measures. Finally, dwellings which bordered on other land uses increased the homeowner's chances of victimization. This is arguably because those adjacent areas bring more unknown users, including offenders looking for targets; these areas of residential and mixed land use also potentially reduce resident's propensity for territorial behaviour.

Residents with both detached and attached garages should take extra care to secure their garage entrances. Unlike front doors that usually secured with a deadbolt, main garage doors can be left open or unlocked, and side doors may be only a door knob lock. These entrances are, by comparison to main entrances, much easier to access and often lead right to the house. Police services should include reminders on their websites and daily media releases to residents about

doing a check of garage entrances to ensure they are properly secured with adequate measures. Most likely, locking and securing the garage is a daily behavioural routine that is not consistently practiced by residents, leaving them vulnerable to break and enters.

Despite the uncertainty about why poor upkeep increases a property's chance for victimization, I recommend that homeowners attempt to make their property appear presentable and clean. Of course, income disparities influence how much homeowners are able and willing to invest in the exterior of their house and property, but even routine maintenance such as mowing the lawn, maintaining gardens, cleaning up clutter or junk or painting worn areas may have an impact in reducing the chances of being burgled.

Finally, residents may require more organized guardianship or territorial behaviour in the form of increased resources from local police. Police services typically identify problem areas and devote more patrol resources or work with community members to alleviate issues as part of Problem-Oriented Policing (POP) initiatives (Goldstein, 1990). Residential areas that are mostly surrounded by other land use could benefit from such POP initiatives, since they have increased chances of being burgled. Increased patrols could simultaneously deter offenders looking for targets, and help support residents to assume control over their properties and immediate areas.

Both the positive and null findings provide some interesting considerations for future work in the field of place-based crime prevention. The overall sentiment here is that CPTED is a promising framework that can be used to manipulate the physical environment. However, much work is necessary to refine CPTED's main concepts, and determine how they are best implemented and assessed in practical applications. Its inception in the 1970s by several major works (Jeffrey, 1971; Newman 1972) has meant that CPTED has never been fully developed by a single researcher or author. Proponents have borrowed relevant or appealing facets of different

versions of CPTED to implement. However, a return to the foundational concepts would be beneficial for future crime prevention initiatives. This ground work will hopefully enable subsequent studies to determine, with solid empirical support, what works in preventing crime. As has been the case thus far with CPTED initiatives, results have been mixed. This could partially be attributed to projects implementing too many strategies simultaneously. Multi-component prevention programs often have a difficult time interpreting what exactly reduced or deterred crime in a particular area. While these programs nonetheless demonstrate reductions in offending, they become difficult to evaluate and replicate because the exact causal linkages between design and crime is lost by the use of multiple prevention features. Projects should begin with a select few measures with clear ways of determining exactly what is responsible (if any) in the reduction of crime experienced in the study area.

Schneider and Kitchen (2007) argue that once place-based theories are properly applied and assessed, it will likely signal to us how situational and culturally specific initiatives need to be in order to be effective in reducing crime. We need to recognize CPTED is perhaps not a broad fitting template, expected to apply equally well to geographically and socially distinct areas. Target hardening, for example, may work well in a culturally diverse housing complex where territoriality may be lessened, but may be less influential in an area where residents collectively work together to control the activities in their neighbourhood. CPTED is a malleable strategy that undoubtedly should co-exist with the social environment as well. Saville and Cleveland's (2003) development of second generation CPTED, which includes social and cultural preventative factors is a step forward, but these social aspects need to be included in the foundational re-workings of this framework, not added on in an after-the-fact manner.

Recent Burglary Trends and Implications for CPTED

In recent years, Guelph Police Service has noted a decrease in reported break and enter occurrences. In 2010, for example, the incidents of break and enters dropped to approximately 450, down from their average of approximately 600 (Guelph Police Service, 2012). The drop could be attributed to more effective defensive tactics employed by residents or the preference amongst criminals to pursue more lucrative property crimes, such as internet or technology fraud, which have increased in recent years. More research should be conducted to determine the reasons why break and enters are decreasing in Guelph, or if this is perhaps a reflection of under-reporting break and enters by victims.

Moreover, other research indicates that the property stolen in burglaries has generally shifted from large electronic devices such as video players and stereo systems, appliances, and power tools to money and smaller items such as laptops, wallets, purses and keys. The theft of jewellery has remained fairly stable over time (Fitzgerald & Poynton, 2011). It appears that burglars are less able to fence electronic goods because of security measures or relatively cheap retail prices for electronics. Instead, the items that are routinely taken in 2010 appear to have instrumental value, meaning they can be used readily by the offender (Fitzgerald & Poynton, 2011). What is evident is the transportability of the property now sought out by burglars; items are easily carried in a backpack or duffel bag on foot, rather than by vehicle. This could mean offenders choose to operate on foot to escape easily and avoid detection, while still being able to steal suitable property. Of course, without the need for vehicles, burglars may operate closer to their home or local area. Additionally, offenders may opt for more obscure entry and exit routes further from the major streets, such as pathways or fields that lead to dwelling's yards.

While CPTED measures may be credited with the decrease in break and enters in recent years, there will continue to be new challenges, such as the changing size and purpose of stolen property. This can bring new types of burglars who may operate in ways that counteract current CPTED informed design features. Those who utilize this place-based prevention approach should be cognizant of how offenders will develop workarounds, such as stealing items that are not marked with an identifying code, or items that require a fence to produce a profit. Those groups and individuals must continually innovate new ways to address the changing nature of crime and the means to prevent it.

Appendix A: Examples of Upkeep Ratings for Dwellings



- a) This house is rated as poor because there are signs of physical degradation and very little property maintenance.



- b) This house is rated as average because there are some signs of routine maintenance and a generally well kept house



- c) This house is rated as excellent because the house is in exceptional condition with apparent signs of regular maintenance.

Appendix B: Non-significant Bivariate Analyses Results

CPTED Element	Variable	χ^2	DF	p-value
Access Control				
	Street Type	1.292	4	.863
	Front Barriers	1.590	2	.451
	Front-Right Barriers	1.261	2	.532
	Front-Left Barriers	3.666	2	.160
	Back Barriers	.598	2	.741
	Back-Right Barriers	1.401	2	.496
	Back-Left Barriers	.104	2	.949
	Front-Back Division	.004	1	.952
	Shed	.909	1	.340
Natural Surveillance				
	Setback (10ft Groupings)	6.333	8	.610
	Visible from the Road	.407	1	.524
	Obstructed Main Entrance	.627	2	.731
Territoriality				
	Corner Lot	1.237	1	.266
	Proximate Lot Right	2.519	1	.112
	Proximate Lot Back	1.751	1	.186

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