Using Local Police Data to Inform Investigative Decision Making:
A Study of Commercial Robbers' Spatial Decisions

Richard M. Cullen, Brent Snook, Kara Rideout, and Joseph Eastwood
Memorial University of Newfoundland

John C. House
Royal Newfoundland Constabulary

ABSTRACT

An examination of the home-to-crime distances (measured as the straight-line distance from the robbery site to the robber's home location) for 177 solved commercial robberies in St. John's, Newfoundland, indicated that half of the robberies were committed within 1 km of the robber's home and the frequency of target selection followed a distance-decay pattern. The relationships between home-to-crime distance and 60 robbery-related variables derived from Royal Newfoundland Constabulary (RNC) data were also assessed. Results suggest that the RNC may be able to use information on robber age, number of robbers involved, setting (urban vs. rural), type of street (side vs. main), and means of escape (walking vs. vehicle) to aid the search for a suspect following a commercial robbery. A discussion is presented on the contribution of these results to a general understanding of offender spatial behaviour. Inconsistent findings in criminal spatial behaviour research, however, suggest that these relationships vary by crime type and geographic region, thus police agencies are urged to analyze their own data on solved crimes to inform investigative decision making within their own jurisdictions.

Comments concerning this paper can be addressed to: Brent Snook, Psychology Department, Science Building, Memorial University of Newfoundland, St. John's, NL, Canada, A1B 3X9 (e-mail: bsnook@play.psych.mun.ca).

Police agencies have access to a wealth of data about offenders and offender behaviour that could be used to inform their investigative decision making. For example, the analysis of data about where offenders commit their crimes (i.e., offender spatial behaviour) can be used to search for the home location of future suspects. It has been documented for at least 70 years that offenders often offend near where they live (Baldwin & Bottoms, 1976; Capone & Nichols, 1976; Gabor & Gottheil, 1984; Herbert & Slawek, 1993; LeBeau, 1987; Turner, 1969; White, 1932). This finding has subsequently been used to inform police predictions about where unknown offenders reside (e.g., Rossmo, 2000). Some researchers have suggested that these spatial predictions can be refined by considering the effects of offender and crime characteristics (e.g., Snook, Cullen, Mokros, & Harbort, 2005; Wiles & Costello, 2000). The goals of the current paper, consequently, are to add to the existing body of knowledge about the factors that are related to the distance from home that offenders commit crimes (i.e., home-to-crime distance) and to propose how findings derived from local police data on past crimes might be able to inform future police decision making about where to search for at-large offenders.

A review of the offender spatial behaviour literature indicates that offenders usually commit crimes within 5 km of their home, regardless of crime type or country (Amir, 1971; Baldwin & Bottoms, 1976; Capone & Nichols, 1976; Gabor & Gottheil, 1984; LeBeau, 1987; Rhodes & Conly, 1981; Turner, 1969; van Koppen & Jansen, 1998; Warren et al., 1998). It has also been shown that the likelihood of committing a crime decreases with increasing distance from the offender's home, a pattern that is commonly referred to as distance-decay (Capone & Nichols, 1975, 1976; Rhodes & Conly, 1981; Snook, 2004; Snook et al., 2005; Warren et al., 1998; van Koppen & Jansen, 1998). There is one exception to the distance-decay pattern, however; according to Rossmo (2000), there is a buffer zone directly surrounding an offender's home where they never offend. Offenders presumably avoid

that area because it involves an increased risk of being recognized (Brantingham & Brantingham, 1984; Phillips, 1980; Rossmo, 2000; Turner, 1969).

Explanations for why offenders commit crimes so close to home are varied. The three most common explanations are based on familiarity, resources, and effort. Proponents of the familiarity explanation reason that offenders have limited spatial awareness of their city or town and are more likely to select crime targets in familiar areas (Brantingham & Brantingham 1981, 1984; Carter & Hill, 1979; Capone & Nichols, 1975, 1976; Rengert, 1989). Cognitive mapping studies support that explanation because offenders tend to centre sketches of their criminal activity areas on familiar areas, such as their home or a recreational area that they visit frequently (Canter & Hodge, 2000). Other researchers have proposed that offenders have limited cognitive and financial resources that prevent them from searching for targets over large areas (e.g., Wiles & Costello, 2000). In addition, some researchers have applied Zipf's (1949) principle of least effort to offender spatial decisions, thereby arguing that offenders attempt to expend minimal effort to achieve their goals (Baldwin & Bottoms, 1976; Bullock, 1955; Godwin & Canter, 1997; Harries, 1980; Kind, 1987; Phillips, 1980; van Koppen & Jansen, 1998). The end result of minimizing effort is the selection of the most appealing target that is located closest to where the offender resides. It should be noted that these three explanations are not mutually exclusive.

What appears to be a consistent theme throughout the varied explanations for why offenders commit crimes close to home is that the search for crime targets is bounded. Offenders appear unable or unwilling to search for targets beyond areas they are familiar with because of limited spatial awareness, limited cognitive and financial resources, and their inherent human motive to minimize the effort they exert to achieve their goals. The outcome of these bounded target searches, which is reflected in the result of empirical studies of criminal spatial decisions (i.e., journey-to-crime research), is that offenders select targets that are located close to their home, work, or places of leisure (Boggs, 1965; Bottoms & Wiles, 1997; Costello & Wiles, 2001; Davies & Dale, 1995; Desroches, 2002; Reppetto, 1974; Wiles & Costello, 2000).

FACTORS RELATED TO OFFENDERS' SPATIAL DECISIONS

Despite the empirical regularity that offenders typically live within a few kilometres of where they offend, some research suggests that there might be individual differences in home-to-crime distance, although findings regarding the relationships of various factors with home-to-crime distance appear somewhat inconsistent. In the following subsections, we review the literature on six factors that have previously been considered to have an effect on offender spatial decisions and also have the potential to be operationally useful for the apprehension of at-large offenders, that is, they may be known to investigators prior to the identification of the offender (i.e., following interviews with victims/witnesses, viewing of video surveillance footage, etc.).

Offender Age

The relationship between offender age and spatial decisions has been explored extensively. The common assumption is that younger offenders have relatively less knowledge and access to resources than older offenders, thus younger offenders are more likely to offend close to home than their older counterparts. Research conducted over many years has generally confirmed this assumption. A positive relationship between offender age and home-to-crime distance has been found for robbery (Nichols, 1980; van Koppen & Jansen, 1998); burglary (Reppetto, 1974); sexual assault (Davies & Dale, 1995; Warren et al., 1998); various juvenile offences (Phillips, 1980); theft from a vehicle (Wiles & Costello, 2000); larceny, breaking and entering, property crimes, and taking and driving (Baldwin & Bottoms, 1976). This relationship has recently been questioned, however. Some research has shown that the relationship between offender age and home-to-crime distance follows an inverted U-shape, whereby home-to-crime distance increases until around the age of 34 years and then decreases (Fritzon, 2001; Snook et al., 2005). Other studies have reported that relatively older offenders that were arrested for shoplifting, taking without consent, and assault causing bodily harm tended to select targets that were located closer to the offender's home than their younger counterparts (Wiles & Costello, 2000). Further still, some researchers have found no correlation between offender age and home-to-crime distance for rapists (Canter & Gregory, 1994) and burglars (Snook, 2004; Wiles & Costello, 2000).

Offender Gender

An offender's gender has also been considered a factor that is potentially related to spatial decisions. Available empirical findings on the relationship between these two variables have been mixed. Phillips (1980) reported that women tend to select targets that are located farther from home than men, Nichols (1980) and Rengert (1975) reported the opposite finding, and Baldwin and Bottoms (1976) and Stephenson (1974) both reported that gender had no effect on home-to-crime distance. Findings regarding gender and home-to-crime distance have been limited by the small number of women offenders that

have been studied, and consequently no compelling explanations have been offered to explain these findings.

Offender Group Size

When offenders commit crimes in groups, the number of members in the group might have an impact on spatial decisions because of the potential for offenders to combine their mental maps and thereby increase the size of the area in which they can comfortably offend (Brantingham & Brantingham, 1984). If offender groups take advantage of this larger area, then it is likely that some of the members will offend farther from home than they would have if they committed a crime on their own. This tendency should potentially increase the average home-to-crime distance for a particular offender. However, research on the effect of offender group size on spatial behaviour has produced inconclusive findings. Some studies have reported a positive correlation between offender group size and home-to-crime distance (Gabor & Gottheil, 1984; van Koppen & Jansen, 1998), whereas others have found no relationship (Baldwin & Bottoms, 1976; Snook, 2004; Turner, 1969; Warren et al., 1998). In addition, van Koppen and Jansen (1998) proposed that the relationship between group size and home-to-crime distance for robbers was not linear, instead following an inverted U-shape whereby home-to-crime distance increased up to robbery groups with three members and then decreased for those made up of four and five members. Van Koppen and Jansen argued that two- and three-member groups can offend at greater distances because they are more professional and thus operate "better" than individual offenders and groups of four or more members.

Urban vs. Rural Setting

Urban settings are usually associated with higher levels of crime than rural settings. Robbery, for instance, is more likely in urban settings because robbery rates increase with increasing population density (Baldwin & Bottoms, 1976; Gabor et al., 1987). In an examination of home-to-crime distance among commercial robbers, van Koppen and Jansen (1998) found that rural settings were associated with larger home-to-crime distances than urban settings. In contrast, Warren et al. (1998) found no difference in home-to-crime distance between rapists in urban vs. rural settings. An explanation for the discrepancy between these findings can be reached by considering the different nature of the targets for robbery and rape. Robbers in rural settings probably have a lower likelihood of offending close to their place of residence than rapists in rural settings because robbers must travel to their victims (stationary residences or commercial premises), whereas rape victims can be mobile. Additionally, there is generally a greater distribution of potential rape victims across the landscape compared to potential commercial robbery targets.

Value of Property Stolen

Some studies have found that the amount of monetary reward from criminal activity is positively related to home-to-crime distance (Capone & Nichols, 1975; Pyle, 1974; Reppetto, 1974). For instance, Baldwin and Bottoms (1976) showed that larger rewards were obtained at farther distances than were obtained at shorter distances from home, noting the largest difference between those stealing less than £100 and those stealing more than £100. They also found that property robberies with higher payoffs were committed farther from home than crimes where lower valued items were taken. Similarly, Canadian offenders who stole more than $200 (Gabor & Gottheil, 1984) and more than $1000 (Snook, 2004) were found to have larger home-to-crime distances than those who stole less than those amounts. These empirical findings suggest that some offenders are willing to expend the mental and physical effort associated with traversing larger distances when they expect larger gains.

Mode of Transportation

Common sense suggests that the mode of transportation used during a criminal activity influences offenders' spatial behaviour. Offenders who travel by a slower means will likely offend closer to home than those who use a mode of transportation that is capable of greater distances in a short period of time. Some evidence for the relationship between mode of transportation and offender spatial decisions comes from research on robbers in The Netherlands that showed that robbers were more likely to select targets that were located farther from home when using a vehicle than when walking (van Koppen & Jansen, 1998). This finding has also been shown for a sample of serial burglars in St. John's, Newfoundland (Snook, 2004). In contrast, other research found that mode of transportation had no effect on home-to-crime distance (Baldwin & Bottoms, 1976; Costello & Wiles, 2001; Gabor & Gottheil, 1984).

The brief review of the literature we have provided on the spatial decisions of offenders indicates that offenders select targets near where they live, but no consensus has been reached about the effects of individual differences and offence characteristics on home-to-crime distance. It appears as though the relationships of the highlighted factors with home-to-crime distance vary by offence type and probably a host of other factors. Such factors may include variable definitions and methods of data collection, but also the geographic or political region that the data pertain to. Because the relationships

may be specific to certain offences and jurisdictions, police data from actual solved crimes may be useful for identifying precisely how such factors relate to home-to-crime distance and how having information on these factors can be useful in the search for future criminals within a particular police agency's jurisdiction.

We have two purposes in conducting the current study. The first goal is to contribute ecologically valid information to the existing research about the relationship between home-to-crime distance and various characteristics of offenders, crimes, and crime scenes. This objective will be accomplished by analyzing police data on convicted commercial robbers in St. John's, Newfoundland. Commercial robbery data is particularly useful for achieving this research purpose because it is a relatively frequent violent crime in St. John's and there is therefore a sufficiently large amount of relevant data available for analysis. Robbery is also of global interest because its occurrence creates a disproportionately high amount of fear and anxiety for victims and the wider community (Barker, Geraghty, Webb, & Key, 1993; Desroches, 2002; Gill, 2000; MacDonald, 1975). Furthermore, from a policing perspective, commercial robbery can be a difficult crime to solve because it typically involves an interaction between strangers, which means that physical evidence is often unavailable to investigators (Feeney, 1986; Gill, 2000), thus the information obtained from the crime scene (e.g., from eyewitnesses, video surveillance) is limited in both quantity and quality. The findings from this analysis will be used to achieve our second goal, which is to argue that police agencies have access to data that can allow them to identify patterns that might be useful for informing future investigative decision making about the search for at-large offenders in their jurisdiction.

METHOD

Data Collection

Data were collected from the Royal Newfoundland Constabulary Headquarters Division (RNC), a police agency whose jurisdiction includes the cities of St. John's and Mount Pearl and the surrounding communities of Bauline, Bay Bulls, Conception Bay South, Flatrock, Logy Bay-Middle Cove-Outer Cove, Paradise, Petty Harbour-Maddox Cove, Portugal Cove-St. Phillips, and Pouch Cove-Torbay. The fifth author identified all robberies that had occurred within the jurisdiction between 1978 and 2001. Identified files were first reviewed to determine whether a *commercial robbery*, as opposed to a home invasion or street robbery, had occurred. Commercial robbery cases were then content analyzed using a coding scheme that was developed by reading the initial reports and any follow-up investigative reports (e.g., victim statements) contained in the files. The coder particularly attempted to identify offender characteristics, target characteristics, robber behaviours at the crime scene, or victim experiences at the crime scene that could be used to distinguish between different robberies (a copy of the complete coding guide derived from the content analysis is available from the second author).

Sample (read section again with N = 177 in mind)

The sample consisted of 132 solved commercial robberies that occurred between 1978 and 2001. The data of interest were the distances between the locations of the robbed commercial premises and the robber home locations. Because some of the robberies were carried out by groups of offenders and some offenders were responsible for more than one robbery, each robber-robbery pair was treated as an independent case, resulting in a sample size of 177 cases (home-to-crime distances). All percentages reported hereafter are therefore in relation to the total *N* of 177.

Ninety-six percent of the robbers were men. Of the eight women robbers, five offended in groups with men. Robbers ranged between 14 and 50 years of age, with a median age of 22.0 years (*M* = 24.1, *SD* = 8.1). The distribution of ages was strongly skewed towards younger robbers; 70% of the robbers were 25 years of age or less at the time of the robbery, whereas just 19% were 30 years of age or older. Forty-seven percent of the robbers offended in groups.

Approximately 93% of the robbers had been arrested prior to the robbery for which they were identified. Of these robbers, most had been arrested for property (89%), violence (61%), and burglary (54%) offences. Arrest histories for weapon-related (27%), robbery (24%), deception (23%), drug (11%), sex (3%), and arson (1%) offences were less common. The crime that the robbers were arrested for just prior to the robbery arrest was typically property crime (45%), which was followed by violence (23%) and deception (1%). Sixty-eight percent of the robbers had been arrested three or more times. Most of the robbers had previously been convicted (84%) or incarcerated (66%). The median number of days since the last arrest was 265.5 (*M* = 473.3, *SD* = 507.7), with a range of 2 to 2270 days. Thirty percent of the robbers had been arrested within the four months preceding the robbery analyzed here, and 59% had been arrested within the past year.

Convenience stores were targeted in almost half of the cases (47%), followed by service stations (24%). The commercial premises' interior was visible from the street in 72% of robberies. Ten percent of robbers tampered with the phone and one robber tampered with security measures. The majority of robbers (72%) did not use a

disguise and robbed after sunset (85%). Very few targets were equipped with video surveillance (11%) or security barriers (5%). The majority of robberies occurred on streets characterized by light traffic (50%), followed by moderate traffic (40%) and heavy traffic (10%). Customers were absent during 83% of the robberies. Commercial robbers became violent with their victims about 25% of the time, usually by pushing the victim (occurring in 18% of robberies). Money was the most commonly stolen item (80%), with the median amount stolen being $250 ($M$ = $1014.87, SD = $2637.72). Cigarettes were the second most commonly stolen item (18%), followed by miscellaneous items (7%) and alcohol (5%). Most robbers escaped on foot (62%), the remainder by the use of a motorized vehicle (38%).

Measuring spatial decisions - For each robbery, the geographic location of the robber's residence (i.e., the home location) during the commission of the robbery and the location of the targeted commercial premises (i.e., the crime location) were plotted using MapInfo. The MapInfo ruler tool was used to measure the straight-line distance between crime locations and home locations in kilometres (i.e., the home-to-crime distances). The measured distance is referred to as the 'home-to-crime distance' rather than the more traditional term 'journey-to-crime' because the police files did not provide information about robbers' journeys. Each journey, thus, could have been longer or shorter than the straight-line home-to-crime distance, depending on the specific route that the robber travelled and whether the journey began at the home location.

RESULTS

Home-to-Crime Distance

Figure 1 shows the distribution of home-to-crime distance (N = 177), which ranged from 0.01 km to 13.30 km (Mdn = 1.02 km; M = 2.41 km, SD = 3.11 km). The distribution appears to follow a distance-decay pattern, whereby the frequency of target selection decreased with increasing distance from the home location. Cumulatively, 118 (67%) of the robberies were committed less than 2 km from the home location, and 145 (82%) were within 4 km of the home location. Only 9 (5%) home-to-crime distances were larger than 10 km.

Figure 1: *Distribution of Home-to-Crime Distance*
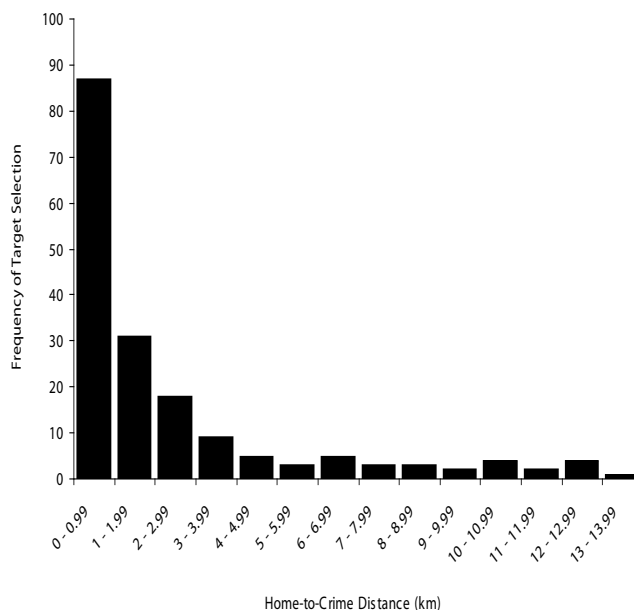
Sixty variables that could be used to distinguish between different robberies and which might be available to police investigators following a commercial robbery were derived from the content analysis. Reliability of the coding was assessed by having an independent researcher code a random sample of 18 (~10%) of the police files according to the coding dictionary derived through the fifth author's content analysis. A Cohen's Kappa of .76 indicated high agreement between the coders (Cohen, 1960).

The relationships between the 60 data-derived variables and robbers' home-to-crime distances were analyzed. The variables pertained to robber characteristics, victim characteristics, target characteristics, and victim experiences at the crime scene. A Bonferroni correction was implemented to control the Type-I error rate associated with conducting 60 statistical tests on the data (a = .001). Summary statistics for the six variables that were discussed in the Introduction are contained in Table 1. Due to the inconclusive nature of many of the findings and lack of research on variables that could facilitate directional predictions, all reported probabilities are two-tailed. Nonparametric tests were used to test all relationships to home-to-crime distance because the home-to-crime distance data were not normally distributed.

**Table 1:** *Summary Statistics for Factors Potentially Related to Variations in Robbers' Spatial Decisions*

Factor	Sample Size	Percentage	Home-to-crime distance (km)		
			Median	Mean	SD
Age					
14-18 years old	43	24.4	2.50	3.70	3.5
19-23 years old	62	35.2	1.24	2.58	3.26
24-28 years old	34	19.3	0.81	1.11	1.26
29-33 years old	12	6.8	1.32	2.31	2.77
≥34 years old	25	14.2	0.75	1.63	3.22
Offender Group Size					
One	94	53.1	0.85	1.46	1.89
Two	45	25.4	1.72	3.11	3.58
Three	33	18.6	1.49	4.17	4.32
Five	5	2.8	2.17	2.08	0.91
Gender					
Female	8	4.5	2.56	4.44	4.32
Male	169	95.5	0.99	2.31	3.03
Setting					
Urban	170	96.0	0.99	2.15	2.76
Rural	7	4.0	10.60	8.70	4.63
Value of Property Stolen					
$25 - $200	61	42.9	1.12	1.91	2.34
$201 - $400	34	23.9	1.01	2.66	3.45
$401 - $600	12	8.5	0.64	1.39	1.50
$601 - $1000	10	7.0	0.97	1.09	0.83
≥ $1000	25	17.6	2.24	4.24	4.33
Mode of Transportation					
On Foot	96	61.9	0.75	1.43	1.87
Vehicle	59	38.1	2.02	4.12	4.18
Street Type					
Main Thoroughfare	126	71.2	1.41	2.91	3.41
Side Street	51	28.8	0.75	1.16	1.16

Note: The sample sizes for age, value of property stolen, and mode of transportation do not sum to the total N of 177 because some data were not contained in the police files.

Offender Age

Figure 2 shows the relationship between age and home-to-crime distance. As can be seen, home-to-crime distance decreases with increasing age. A Spearman's rank-order correlation confirmed that there was a significant relationship between the two variables, rs = -.33, n = 176, p < .001. The Figure also shows, with the exception of a few robbers, that robbers that were older than 25 years of age did not target commercial premises that were located farther than 3 km from the home location.

**Figure 2.** *Relationship between robber age and home-to-crime distance.*
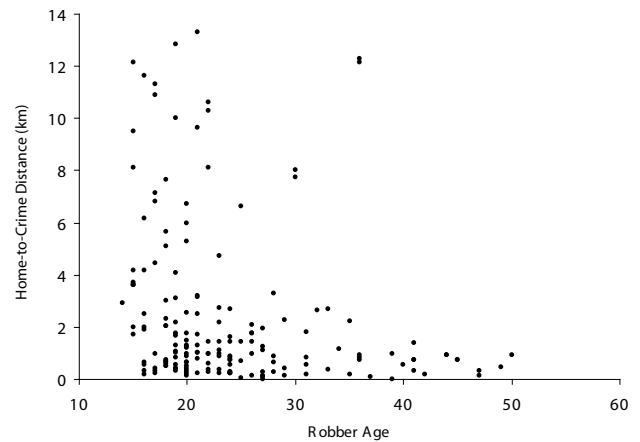
Offender Gender

A Mann-Whitney test showed that there was no significant difference between home-to-crime distances for women (*n* = 8, *Mdn* = 2.56 km, *M* = 4.44 km, *SD* = 4.32 km) and men (*n* = 169, *Mdn* = 0.99 km, *M* = 2.31 km, *SD* = 3.03 km), *U* = 360, *p* = .026.

Offender Group Size

Figure 3 shows the relationship between group size and home-to-crime distance. Because of non-normality in the home-to-crime distance distribution and the high number of ties in group size, a Kendall's tau-b was used to establish that the positive relationship between home-to-crime and group size was statistically significant, τ = .26, *N* = 177, *p* < .001.

Figure 3. *Median home-to-crime distance for robbery groups of various sizes.*
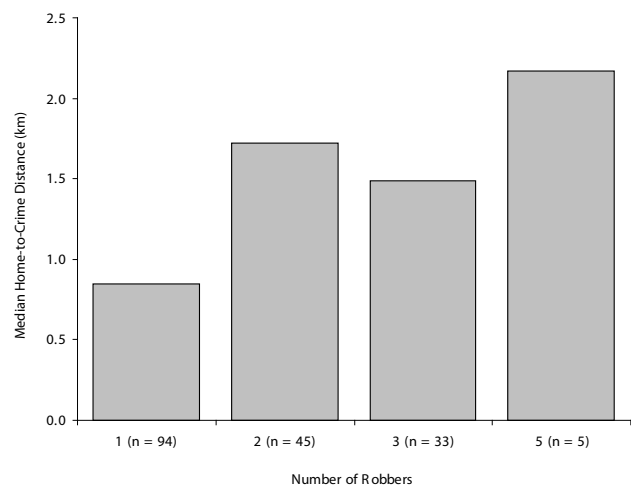
Urban vs. Rural Setting

A Mann-Whitney test showed that the home-to-crime distance for robberies that occurred in rural areas ($n = 7$, $Mdn = 10.60$ km, $M = 8.70$ km, $SD = 4.63$ km) was significantly larger than for those that occurred in urban areas ($n = 170$, $Mdn = 0.99$ km, $M = 2.15$ km, $SD = 2.76$ km), $U = 123$, $p < .001$.

Value of Property Stolen

There were 142 cases (80%) for which a cash value was assigned to the amount of property stolen. A Spearman's rank order correlation showed that the amount of cash stolen during those robberies was not significantly related to the home-to-crime distance, rs = .14, p = .104.

Mode of Transportation

A Mann-Whitney test showed that the home-to-crime distance was significantly shorter when robbers escaped on foot ($n = 96$, $Mdn = 0.75$ km, $M = 1.43$ km, $SD = 1.87$ km) than when they used a vehicle ($n = 59$, $Mdn = 2.02$ km, $M = 4.11$ km, $SD = 4.18$ km)5, $U = 1452.5$, $p < .001$.

Of the remaining 54 variables that were explored, only one was significantly related to home-to-crime distance and thus is reported in Table 1. A Mann-Whitney test showed that the home-to-crime distance for robberies on main thoroughfares ($n = 126$, $Mdn = 1.4$ km, $M = 2.9$ km, $SD = 3.4$ km) was larger than the home-to-crime distance for robberies on side streets ($n = 51$, $Mdn = 0.8$ km, $M = 1.2$ km, $SD = 1.2$ km), $U = 2009$, $p < .001$. All variables that were identified from the content analysis of the police records, but were found to not be significantly related to home-to-crime distance, are listed in Table 2.

Table 2: Variables that were not significantly related to Commercial Robbers' Home-to-Crime Distance

Variables [a]
Temporal Characteristics
Month of the year
Day of the week
Time of the day [b]
Robbery occurred in daylight vs. in darkness
Crime Characteristics
Robbery executed vs. robbery abandoned
Cigarettes stolen
Alcohol stolen
Cash stolen
Additional items stolen
Nothing taken
Value of property stolen
Target-Related Characteristics
Interior of commercial premises visible from street
Video surveillance
Security barrier
Located in commercial vs. residential district
Level of traffic [c]
Type of commercial premises [d]
Number of staff [e]
Gender of staff [f]
Customers present
Number of customers [g]
Gender of customers [h]
Crime Scene Actions
Verbal threats
Used spontaneous threats vs. responded to resistance
Robbery announced
Robber justified robbery
Robber apologized
Robber used foul language
Robber reassured victim
Verbal demand for cash/item
Robber directs victim
Victim told to lie on the floor
Victim told to delay reporting or not report robbery
Victim required to count
Victim bound
Victim blindfolded
Sawed-off long firearm used
Gunshots fired
Weapon not seen but implied
Known imitation of weapon
Robber made physical contact with victim
Victim was pushed
Victim was punched
Actual stabbing or attempt to stab
Disguise used
Lookout used
Security measures tampered with
Phone disabled
Note given
Controlling style of aggression vs. Gratuitous style of aggression
Immediate/surprise confrontation style vs. delayed/interactive confrontational style
Robber exhibited restrained demeanour vs. aggressive demeanour
Robber had visible tattoos
Robber gender
Weapon type [i]

Note: [a] *Unless specified, all variables were dichotomously coded (1 = present and 2 = absent);* [b] *time categories were: 0:00 to 5:59, 6:00 to 11:59, 12:00 to 17:59, and 18:00 to 23:59;* [c] *traffic categories were: heavy, moderate, and light;* [d] *target location categories were: convenience store, gas station, department store, fast food, pharmacy, night club, restaurant, and other;* [e] *number of staff categories were: one, two, three, and four or more;* [f] *gender of staff categories were: men only, women only, both men and women,* [g] *number of customer categories were: one, two, three, and four or more;* [h] *gender of customer categories were: men only, women only, both men and women,* [i] *weapon categories included: knife, handgun, long firearm, no weapon, and club tool.*

DISCUSSION

Similar to robbery-related characteristics reported elsewhere (e.g., Desroches, 2002; Feeney, 1986; Gabor et al., 1987; Gill, 2000; Kapardis, 1989; MacDonald, 1975), most of the robbers in the current sample were young men who had previously been arrested, convicted, and incarcerated for a range of crimes; convenience stores and service stations were the most commonly robbed commercial premises; robbers rarely wore a disguise or tampered with security measures; and robbers usually did not become violent with victims. In addition, this study supported the consistent finding that most robbers commit crimes close to where they live (e.g., Barker et al., 1993; Capone & Nichols, 1975, 1976; Feeney, 1986; Gabor & Gottheil, 1984; Reiss & Farrington, 1991; van Koppen & Jansen, 1998; White, 1932; Wiles & Costello, 2000).

Analysis of the distances between robbers' homes and robbery sites showed that St. John's commercial robbers, on average, robbed commercial premises within 2.4 km of their homes, with half of the targeted commercial premises located within 1 km of the robber's home. The distribution of home-to-crime distance appeared to follow a distance-decay pattern (Rossmo, 2000), whereby the frequency of target selection decreased as the distance from the robbers' homes increased. The short median (1 km) and minimum (0.01 km) home-to-crime distances appear to challenge the existence of a buffer zone (Rossmo, 2000), but it is likely that the size of the area directly surrounding robbers' homes in which they never offend is a variable that is dependent on characteristics of the individual robber and features of the geographic location.

Much research has found that older offenders select crime targets farther from home than their younger counterparts do (e.g., Nichols, 1980; van Koppen & Jansen, 1998). This relationship was not observed for commercial robbers in St. John's, Newfoundland. Instead, as in Snook et al.'s (2005) study on German serial murderers' spatial decisions, home-to-crime distance was found to decrease with increasing age. These findings, in conjunction with results from other reports (e.g., Wiles & Costello, 2000), suggest that the positive relationship between an offender's age and spatial decisions, which was once thought to be fairly consistent, is not reliable because it appears to vary by crime type and the geographic area of criminal activity.

In the current study, as well as some previous studies (Gabor & Gottheil, 1984; van Koppen & Jansen, 1998), home-to-crime distance was positively related to the number of robbers jointly involved in a robbery, that is, larger groups exhibited larger home-to-crime distances than smaller groups. This finding can be explained by Brantingham and Brantingham's (1984) reasoning that the combination of two or more mental maps increases the area in which an offence might occur, but it should be noted that other researchers have found that offender group size is not related to offender spatial decisions (e.g., Baldwin & Bottoms, 1976; Warren et al., 1998). Van Koppen and Jansen (1998) found a positive statistical relationship between group size and home-to-crime distance, but proposed that this relationship appeared to actually follow an inverted U-shape. In the current study, it also appeared as though a U-shaped pattern may have described the relationship between robbery group size and home-to-crime distance, but the quadratic trend was not examined statistically because few robberies were committed by groups with more than three robbers.

Unsurprisingly, the mode of transportation that commercial robbers use to escape from a robbery site also influences their spatial decisions. Home-to-crime distances were shorter among the current sample when robbers escaped on foot than when they escaped in a vehicle. Vehicles clearly enable offenders to cover greater distances in shorter periods of time. Several other researchers have predicted the same finding (Baldwin & Bottoms, 1976; Costello & Wiles, 2001; Gabor & Gottheil, 1984; van Koppen & Jansen, 1998) and Snook (2004) found support for this prediction.

Whether a robbery was committed in an urban or rural area can also be useful when trying to narrow down the area where the robber might live. Commercial robberies that occurred in rural areas within the Royal Newfoundland Constabulary's jurisdiction were associated with much longer home-to-crime distances than those in the urban areas. This finding is in accordance with van Koppen and Jansen's (1998) research and, although Warren et al. (1998) reported the opposite finding, it was not surprising considering the relative abundance of commercial premises as well as the relatively shorter distance between commercial premises and residential premises in urban areas compared to rural areas. We suspect, furthermore, that the effect of urban vs. rural setting on offender spatial decisions might be more pronounced in other regions because the cities included in the current analysis – St. John's and Mount Pearl – are relatively small and sparsely populated compared to many other urban centres.

The final factor that influenced robbers' spatial decisions in this study was the type of street – main thoroughfare or side street – on which the commercial premises was located. Robbery targets on side streets were significantly closer to the robber's home than targets on main thoroughfares. This might be due to the fact that

commercial premises on side streets are more likely to be familiar to, thus to be targeted by, local residents. Commercial premises on thoroughfares, by contrast, are likely to be familiar to people in the immediate area as well as people from farther away who traverse the area on a more routine basis (Brantingham & Brantingham, 1981).

An offender's gender and the value of property stolen during an offence are additional factors that have been proposed to have an influence on offenders' spatial decisions. But in the current study, neither of these factors could explain variation in home-to-crime distance. Other researchers have also found that gender had no effect on spatial decisions (e.g., Baldwin & Bottoms, 1976; Stephenson, 1974). However, like many studies that have previously examined the effect of gender on spatial decisions, the current study included very few women offenders, thus making it difficult to examine a gender effect. The finding regarding value of property stolen was not anticipated because larger crime payoffs are generally associated with longer home-to-crime distances (e.g., Gabor & Gottheil, 1984; Snook, 2004), but previous research which has reported this relationship did not involve commercial robbery data.

Although there were a great number of factors that were not significantly related to commercial robbers' spatial decisions (Table 2), they are worthy of attention nonetheless. Police investigators may suspect that home-to-crime distance is influenced by one or more of these factors, such as timing of the robbery, when in fact it appears that this variable does not influence robber spatial decisions. In regions outside of the RNC's jurisdiction, moreover, some of these variables might be useful predictors of robber spatial behaviour.

The results of this study contribute to the body of literature regarding offender, in particular robber, spatial decisions. Because it appears that the relationships of many factors to spatial decisions vary across crime types and regions, it is important to specify the conditions and the geographic regions for which certain relationships can be expected. For instance, some of the inconsistencies of the current findings with previous research may be attributable to unique features of the region of St. John's, Newfoundland (e.g., culture, social norms, offender demographics) and the types of robberies that are common to that area.

In addition to contributing to the body of literature about offender spatial decisions, the results of this study suggest that police agencies have access to data that may be of investigative value to them. Most importantly, police officers should be aware that most offenders commit crimes close to where they live. Furthermore, all of the factors mentioned in the preceding paragraphs can po-

tentially be derived from even a limited eyewitness account and at least one person (i.e., commercial premises staff) usually witnesses a commercial robbery. Moreover, many commercial premises are equipped with video surveillance. Thus, the observed relationships, or lack thereof, of these factors to robbers' spatial decisions may be practically useful for guiding a police officer's search for an at-large robber's home. If we assume at least one accurate eyewitness account or surveillance video, factors such as age and mode of transportation can be used to make inferences about how far away from the crime scene the robber is most likely to reside. A commercial robber seen escaping in a vehicle, for instance, probably lives farther from the crime scene than a robber who escaped by foot, and a suspect who is over 30 is likely to live nearer to the crime scene than a younger robber would.

It should be emphasized that this article was intended to show police officers that they have a wealth of data at their fingertips that they can use to facilitate the search for at-large offenders. Although the approach employed in this article may resemble approaches to criminal profiling, thus may be construed as supportive of the practice of criminal profiling, it should instead be considered in the opposite light. Because spatial patterns appear to vary by crime type and region, among other things, it is unrealistic to believe that a criminal profiler would have all the pertinent knowledge to make spatial predictions for every crime in every location. We advocate that police officers could use their own data to make their own predictions within their own jurisdictions. The adoption of this practice into the investigative repertoire would allow for quick predictions without the elicitation of assistance from outside the police agency, predictions that may indeed prove to be more accurate than those based on global consistencies in offender spatial behaviour.

It is important to note that the data used in the current analysis are particularly valid for identifying factors related to offender spatial behaviour because they were collected from police files on actual solved commercial robberies. Most data collected from laboratory studies, on the other hand, involve a risk that the participant is conscious of the research process, which introduces a variety of potential data distortions associated with the experiment and experimenter (e.g., demand characteristics, social desirability) and the instrument used (e.g., vague questioning, leading questions, hidden assumptions) (Coolican, 1990). However, the researcher has no control over archival police data and this type of data does not require the use of a measuring instrument. This is a clear benefit because any relationships detected in the data are likely to more accurately reflect real offender

actions as they occur naturally in the environment. In other words, data collected during police investigations is *ecologically valid*. Police strategies that take advantage of naturally occurring relationships are thus *ecologically rational*. Ecological rationality is concerned with the structure and representation of information in the environment and how well mental strategies, such as how to conduct a search for an at-large offender, match that structure (Gigerenzer & Todd, 1999). Because the data used in this research is the same as that found in police files, these findings are directly useful to the police. While there are some disadvantages to using this type of data (e.g., variations in data collection), police forces have to deal with these same disadvantages in order to use their data to improve policing practices. Furthermore, Wiles and Costello (2000) checked that the police data they used to examine offenders' spatial decisions was useful by conducting interviews with convicted offenders and found that the results from the two sources were reasonably consistent.

The data analyzed in the current study were collected from initial police reports and any follow-up investigative reports (e.g., victim statements). There existed individual variation in the detail of these reports; therefore, the absence of some robbery feature from a report does not necessarily indicate that it was not present during the robbery. Therefore, the police data are not without limitations. In addition, this study focused on solved crimes (because the home location of the offender is unknown for unsolved crimes), thus the results may only hold for the least successful robbers (i.e., those which are apprehended and convicted).

In sum, this study showed that commercial robbers in St. John's tend to select targets that are located within a couple of kilometres from their homes. In particular, offender age and group size, urban or rural setting, type of street, and mode of escape could be significant predictors of home-to-crime distance. Although further research is required to determine the operational value of such indicators for police investigations, the current results suggest that it might be possible for investigators to use such findings to develop simple heuristics for predicting the home location of at-large commercial robbers.

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RICHARD M. CULLEN *is currently completing a M.Sc. in Experimental Social Psychology at Memorial University of Newfoundland. He obtained his B.Sc. (Honours) from Memorial in 2005. His general research interests include bounded rationality, forensic psychology, and judgment and decision making. Richard's recent research involves the development of a model that explains how people form beliefs about investigative techniques in the absence of compelling empirical evidence. Richard was awarded a SSHRC CGS-Master's Scholarship in 2006 to pursue his graduate work involving the examination of evidence for the usage of simple heuristics in legal decision making.*

BRENT SNOOK *is an Assistant Professor and Director of the Bounded Rationality and the Law Laboratory at Memorial University of Newfoundland. He obtained his Ph.D. at the University of Liverpool, United Kingdom. Brent's research primarily involves the study of bounded rationality and the law. He is particularly interested in the types of simple heuristics that people use to make consequential decisions in legal settings, when and why those heuristics work succeed and fail, and the conditions under which simple heuristics are used. His research interests also include pseudoscience in the criminal justice system.*

KARA RIDEOUT *obtained her undergraduate degree in Psychology at Memorial University of Newfoundland. She has worked as a research assistant studying offender spatial behaviour at Memorial.*

JOSEPH EASTWOOD *is currently a Master of Science candidate in Experimental Social Psychology at Memorial University of Newfoundland. He received his B.A. (Honours) from the University of New Brunswick, Canada. His research interests include criminal profiling, psychic detectives, decision-making, and forensic psychology. Joseph was awarded a SSHRC CGS-Master's Scholarship in 2006 to pursue his graduate work on investigative practices.*

JOHN C. HOUSE *is an Inspector in charge of crimes against persons for the Royal Newfoundland Constabulary (RNC). He has been with the RNC for twenty-six years, working for most of his career in the Criminal Investigation Division. He was the inaugural recipient of the Canadian Police College's Police Research Scholarship in 2004. He holds a Master of Science degree in Investigative Psychology from the University of Surrey, UK. His research interests include criminal profiling, intelligence-led policing, and major case leadership.*