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Knowing Your Odds: Home Burglary and the Odds Ratio

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Abstract

This paper analyzes the utility maximization of a burglar who anticipates the revenue generated by his action along with the associated costs. The benefits are the value of the loot. Costs include the location of the home, the physical appearance, the demographic characteristics, and the security precautions present. When combined, they will either attract or detract criminal activity.

A survey relating characteristics of Greenwich, Connecticut homes to burglary rates is used. The Logit model and the odds ratio integrate the above home characteristics to determine the likelihood of the home being victimized. The odds ratio calculates the probabilities of the home being victimized as a function of its characteristics.

The results suggest the relative importance of each factor in contributing to the home becoming a target of burglary. The model can be used to predict the chances of homes being burgled depending on it specific attributes.

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1. Introduction

The motives of burglars in choosing their life path, deciding to commit a burglary, and ultimately targeting a specific property, are an interrelated decision process. Much of the early research focused on the first element of this process, the causes of a criminal lifestyle concentrating on the temporal dimension of these activities (Becker, 1968; Merton, 1968; Ross, 1977). However, in the last two decades, empirical investigations in regional science and criminal justice introduced the spatial search for targets by residential burglars (Brantingham and Brantingham, 1984; Rengert and Wasilchick, 1985; Hakim 1980; Deutsch, 1984; Buck, 1991). These empirical investigations used either individual case studies or aggregated databases as levels of analysis.

This paper analyzes the probability of a home being victimized depending on the site characteristics of houses, their situation in space and preventive measures used by the homeowners. The contribution of this work is the use of revealed activities of residential burglars as they are portrayed in a large number of burgled and non-burgled homes to calculate the probability of burglary for each variable. Some variables are controllable by the residents such as the security precautions maintained (e.g., car always on the driveway, exterior and interior lights) while some are not (e.g., location and value of the home, or its distance from main roads). The hypothesized motives are drawn from previous theoretical and empirical studies. The present analysis uses data from a survey that was conducted by the researchers of homes in a suburban community. A multivariate logit model is used to calculate the model and the associated probabilities.

Section 2 reviews the literature on criminal choice behavior. It presents the rational choice model of both the motives in choosing a criminal career, and the choice of a target for crime. It then presents the findings of ethnographic studies where individual burglars were interviewed to learn about their spatial target choice. Section 3 discusses the revealed activity model used in the present analysis. Section 4 presents our data base and a description of Greenwich, Connecticut, the site of our survey. Section 5 provides the results

of the statistical analysis and Section 6 concludes with the major findings and policy implications of the study.

2. Literature Review

The theoretical approach to the prevention of residential burglary has undergone change since the 1960s. Before this period, the dominant view was that improving the socioeconomic conditions of our society could control residential burglary as well as other crime. The thought was that some lower socioeconomic individuals were forced into crime by forces beyond their control such as the lack of legitimate economic opportunities (Bursick and Grasmick, 1993; Merton, 1968). This line of reasoning became known as the "positivist approach." The positivists reasoned that through scientific inquiry, criminal behavior could be explained. Then, policies could be identified which could counteract criminal tendencies.

Critics of the positivist approach pointed out that crime often flourished at exactly the same time that the economy was offering the most opportunities for participation (Cohen and Felson, 1979; Wilson, 1975). Furthermore, many criminals were derived from the upper classes, especially white-collar criminals (Katz, 1988). Most importantly, efforts at rehabilitation of criminals were not generally successful. In fact, the record of rehabilitation was so dismal that some scholars advanced the idea that "nothing works" (Lipton, Martinson, and Wilks, 1975; Martinson, 1974).

In the 1970s, the notion that criminals were not necessarily forced into crime began to dominate. This idea was formalized by Nobel Prize laureate Becker's (1968) seminal work that set out the "rational approach" to property crime. He postulates that a criminal evaluates costs and benefits not only in choosing a criminal lifestyle, but also in deciding whether to carry out a particular crime. Benefits include both monetary and psychological rewards, while costs include direct expenditures as well as the opportunity costs of the criminal's time. Hakim (1980) introduced the spatial dimension to the temporal model by including the search for a crime site taking into account the location of homes and their specific attributes.

The rational approach to criminal behavior is not new. Beccaria formulated the idea termed classical theory as far back as 1764. His theory also explains the decision to engage

in crime through a minimally rational calculation composed of the benefits associated with the commission of a crime and the consequences associated with the same act (Beccaria, 1764; Bentham, 1967; Cherniak, 1986; Cornish and Clarke, 1986). Beccaria's work was designed to limit the exceedingly harsh punishments of the time to those that would just counteract any gain the criminal experienced from a criminal act. However, it assumed a rational offender who weighs the risks and rewards of a criminal act. It focused on the deterrence necessary to counteract rewards gained from criminal acts.

Both classical theory and the positivist approach required that the individual citizens assume a passive role and defer to public institutions for protection (O'Shea, 1999). By the 1980s, this line of reasoning began to change with the advent of "situational crime control" (Cornish and Clarke, 1986). No longer were scholars concerned with explaining why some people offend and others do not. Rather, it was assumed that offenders existed and it was the role of the individual citizen as well as public officials to create situations where crime would be less attractive.

Even before the 1980s, Newman (1972) argued that individuals as well as public institutions could create "defensible spaces" that deterred a rational offender. Criminals would be reluctant to select a target in which either discovery was more likely or the act was made too difficult.

Similarly, Kelling and Wilson (1982) formulated the "broken windows" concept where criminals choose locations that they perceive as not being cared for by the local residents. Increasing the risks of such behavior at specific locations could control an offender's predisposition to criminal behavior. One need not bother analyzing the forces that shaped the criminal behavior because the complexities of human behavior were assumed away (O'Shea, 1999). However, the rationality of the offender is central to situational crime control.

Research on active offenders is important if we are to determine which crime prevention techniques are effective. For example, we are not likely to reduce offending unless we understand how offenders interpret criminal opportunities. For example, suppose that the two most important factors in burglars' choice of a target are proximity to major arterial roads and that no one is at home. In such a case, highly accessible homes require

special attention to produce "evidence" that somebody is home (Wright, Logie and Decker, 1995; Hakim and Shachmurove, 1995).

Some researchers seem skeptical whether criminals actually conduct rational spatial search-and-choice decisions. Reiss (1986: 6) for example wrote, "It seems doubtful, however, that individual offender decisions largely account for differences in the concentration of crime in space, given the ubiquity of criminal opportunities".

Addressing this skepticism has been the point of several ethnographic studies of active criminals, especially residential burglars. Rather than following a specific theoretical thrust, these researchers decided to begin with no preconceived notions and to determine what the criminals could contribute to the understanding of the criminal process. These researchers asked the residential burglars questions in order to develop new ideas that would explain their behavior. Only by conducting exploratory research of active offenders are we sure of how they evaluate the environment available to them.

The National Institute of Justice, which is the research arm of the United States Department of Justice, commissioned several of these ethnographic studies in the late 1980's and the early 1990's (Cromwell, Olsen, and Avery, 1991; Rengert and Wasilchick, 1989; Wright and Decker, 1994). In these studies, active residential burglars were identified and queried on their motives in choosing crime sites. Residential burglars are especially appropriate since they often plan their crimes before executing them. Special attention was given to how residential burglars balanced the risks of their acts with the rewards they perceived they would receive.

Cromwell, Olson and Avary (1991) documented that there was a difference between site characteristics of a home that are perceived from the street when searching a target and those experienced by the burglar when approaching the home to break-in. Burglar alarms and signs of occupancy deter while dogs do not. Not surprisingly, locks on doors that that are noticed only when a burglary attempt is made have no deterring effect. With regard to the original motivation to commit a burglary, the authors discovered that the majority of the burglars were motivated by the need for money to purchase illegal drugs.

Wright and Decker (1994) studied residential burglars in St. Louis. These burglars were far more cognizant of potential rewards than the risks of committing a burglary. Yet, they attempted to decrease the risks of committing a burglary by spending less time in the

building. Rengert and Wasilchick (1985) argue that burglars sometimes chose smaller homes in order to minimize the time they are within the building. They also feel more comfortable in a small house that resembles where they live, while large homes intimidate them.

Tunnell (1992) who interviewed burglars in Tennessee found that criminals could not articulate specific reasons why they avoid a particular site, but rather attributed it to instinct. That is, the site just did not feel right. This could be a subconscious evaluation of a package of characteristics that added up to unacceptable risks, rather than only one characteristic of a site. Senses like sight, hearing, smell, or other receptors identified unacceptable targets.

These studies suggest that offenders engage in some sort of rational calculation temporally prior to the decision to actually offend. They are cognizant of the characteristics of a site and its spatial location. Burglars recognize certain cues or packages of factors, and decide to commit a residential burglary in a location where benefits associated with the commission of an action are perceived to be greater than the risks associated with it.

3. The Present Study: The Revealed Activity Model

In the present study, we infer the decision process of residential burglars from the results of their actions. In geography and regional science, this form of analysis is referred to as "revealed activity" (Rushton, 1969). The idea is that the pattern of activities we observe would not have been possible unless burglars are rational and followed a specific behavioral model. This behavior is assumed to result from a logical and rational decision process. Burglars consider gains and losses of each attempt. They decide to commit a residential burglary if it is perceived to yield net gain and the targeted home yields the highest such gain of all browsed homes, given their urgent need for money (Wright and Decker, 1994).

The above-cited qualitative studies have demonstrated that property criminals make conscious decisions during the commission of an offense by weighing the costs and benefits of the crime. These cues help the offenders choose which homes to burglarize and which homes to pass up (Bennett and Wright, 1984; Cromwell, Olson, and Avary, 1991; Rengert and Wasilchick, 1985). In studying the results of the decisions made by many residential

burglars, we can ascertain which locations they prefer within a bounded suburban community, and which attributes attract or dissuade them from choosing a particular home to penetrate.

The empirical model evaluated in this study includes the event of a burglary as a function of site characteristics of the home, the socioeconomic characteristics of the household, and the location of the home as it is situated in its micro and macro surroundings.

We begin by discussing site characteristics that were found to influence the decisions of burglars in previous studies. One of the most important site decisions facing a homeowner is whether or not to install a burglar alarm. This has been a controversial issue for two reasons. The first is the cost to society of false activations. LeBeau and Vincent (1997) found that in Charlotte, North Carolina, almost 98 percent of the 48,662 burglar alarm activations were false alarms. Only 117 on-scene arrests were made from alarm activations. The authors conclude that alarms are neither effective nor efficient. Clearly, false activations are just one cost variable and no benefit variables were considered. A more comprehensive evaluation is necessary for reaching the conclusion that alarms are ineffective and inefficient.

Hakim, Rengert and Shachmurove (1995) conducted a social cost benefit for burglar alarms using data for Tredyffrin Township, a suburb of Philadelphia. They demonstrated that regardless of the large number of false activations, alarms provide a net benefit to the legal population by deterring crime.

The second issue is whether burglar alarms displace crime onto unalarmed homes. An alternative hypothesis is that in an area where most homes contain burglar alarms, a non-alarmed home enjoys an umbrella of security. Clarke and Weisburd (1994) have demonstrated that indeed the alternative hypothesis is supported. Situational crime control in the form of alarms in fact diffuses benefits onto neighboring un-alarmed homes rather than costs, namely displacing crime onto them. In this case, the benefits of alarms are measured in crimes deterred rather than criminals arrested as in the Charlotte case cited above. In the present study, we follow this approach to test whether or not alarms are effective in deterring residential burglars.

The next six variables used in our study in explaining the incidence of burglary are commonly believed to be effective deterrents to residential burglars (Cromwell, Olson, and Avary, 1991; O'Shea, 1999; Wright and Decker, 1994). Four of these variables are designed to trick the potential burglar into believing the home is occupied. For example, if there is a car in the driveway even when there is no one in the home, a burglar may proceed down the street without further surveillance of the home. This variable is measured as a dichotomy; zero if there is not and one if there is a car in the driveway when the home is indeed unoccupied. Likewise, a timer and/or a motion sensor are designed to make the burglar believe the home is occupied. This variable is measured as a dichotomy, zero if there is no timer or motion sensor, one if there is. Having a radio or television on a timer is measured in the same manner, zero if the answer is no, one if there is a radio or television on a timer. Finally, if mail is not collected and old newspapers are evident on the lawn, it is a sign to a potential burglar that no one is using the home at this time (O'Shea, 1999). If a neighbor does not collect mail and newspapers when the family is away from home for an extended period, this variable is scored a zero. It is given a one if a neighbor or friend performs these tasks.

There are four locational factors that measure where the home is situated in the community. The first is the proximity of the home to major thoroughfares. Bevis and Nutter (1977) revealed in a study in Minneapolis that the more accessible the home, the greater the probability of burglary. The safest streets were dead-end streets with only one way in or out. In the present study, this variable is measured as a dichotomy, zero if the home is not and one if it is located on a dead-end street.

Several studies discovered that houses located on a corner are more vulnerable to residential burglary than those on the middle of a block (Rengert and Wasilchick, 1985; Cromwell, Olson, and Avery, 1991). Corner houses are logical places for a burglar to ring a doorbell and ask for directions. It is a favorite ploy of residential burglars to determine if someone is at home—ask directions. It seems less "natural" to ask directions in the middle of a block. Further, a corner home is visible to the browsing burglar who can view much of the home and easily notice the merits of breaking into the house. A home in the middle of a block is less noticeable and therefore less prone to burglary. This variable is a dichotomy given a zero if it is not a corner house and a one if it is.

Houses bordering on a wooded area or playground are more vulnerable to burglary since they do not have neighbors who can watch the homes. Also, woods provide concealed access (Hakim, 1995). This variable is measured as a dichotomy, zero if the house does not border on a wooded area or playground, and one if it does. Finally, research has demonstrated that locations near an exit from a major thoroughfare into a community are especially vulnerable to crime (Rengert and Wasilchick, 1985). However, if a burglar does not discover a promising property within two or three blocks of the exit, he/she often returns to the highway and locates another community. We measure accessibility to major arterial roads as an ordinal variable. If the home is within a quarter of a mile of an exit, it is scored a zero, one for a quarter of a mile to half a mile, two for half a mile to a mile, and three if the distance is beyond a mile.

Four socioeconomic variables are included to express attractiveness of homes to burglars. The first variable is the value of the house. The more expensive the house, the more expensive items it is expected to contain (Hakim, 1995). If the house is valued at less than 150,000 dollars it is scored a zero, one between 150,000 and 300,000 dollars, two for 300,000 to 600,000 dollars, 3 for 600,000 to 900,000 dollars, and 4 for homes valued over 900,000 dollars. Likewise, single-family homes are expected to contain more valuable items than townhouses, duplexes, or apartment units. This variable is measured as a dichotomy, zero if it is not and one if it is a single family home.

The number of children in the family is a measure of potential household guardianship (Cohen and Felson, 1979). The more children in the home, the more likely one of them will be home. Furthermore, if they are young children, the mother is more likely to be working in the home postponing a career outside the home. This variable is measured as an interval with its value equal to the number of children in the household. Finally, the longer the family has lived in the home, the more likely they have close ties with their neighbors who would recognize strange occurrences. This variable is measured as an interval value representing the number of years the family has lived in the present home.

These variables compose the explanatory variables in our model. The dependent variable is whether or not the home has been burglarized. It is scored a zero if it has not been burglarized, and a one if it has.

4. Data and Methodology

The data used in this analysis is derived from a survey conducted in the affluent community of Greenwich, Connecticut. Greenwich is located in the southeast corner of Connecticut, approximately 30 minutes by automobile from midtown Manhattan and 20 minutes from the Bronx. According to the Greenwich police records, the vast majority of apprehended burglars are from New York City as well as some transient passengers on the transportation corridor of Boston to New York City.

Greenwich is one of the ten wealthiest suburbs in the nation. The median family income was $77,600 in 1990. It also has a relatively young population; the average age of the head of a household was 39.9 years. The median value of housing in 1990 was $499,900. These figures indicate that Greenwich is a relatively young affluent suburb of New York City.

Greenwich is a very desirable residential community. It extends along Long Island Sound and includes 2.6 square miles of islands. It contains 22,192 households of which 93 percent are white. Commercial establishments make up 18.4 percent of the tax roll and paid 2.3 million dollars in taxes in 1990. This combined with the residential tax base translates into excellent community services including public schools. Not surprisingly, unlike many other localities, non-local residents conduct most of the property crime.

Greenwich contains 23,649 dwelling units of which 63.4 percent are single-family homes. There also are 89 apartment buildings and 61 condominium complexes. The number of multifamily units has been increasing. High taxes and land values prompted many long-term residents to sell their extra land to builders. The 23,649 dwelling units contained 22,192 permanent households.

The local police department sent a survey to all 22,192 households in 1993 in Greenwich. The survey was attached to a letter from the Chief of Police encouraging participation, and the return address was that of the police. A total of 3,014 completed questionnaires were returned, about 14 percent of the surveys mailed out. Of these responses, 13.6 percent had experienced a burglary since residing in their present home. Thirty-four percent of these burglaries occurred within the first five years of residence. The following analysis determines the factors that differentiate the 13.6 percent of residents that experienced a burglary from the 86.4 percent that did not. We are especially interested in

whether factors under the control of the homeowner are as important as those factors that can not be altered once the home is purchased.

5. The Analysis

The dependent variable as well as some of the independent variables is measured in the form of a dichotomy. Therefore, a logistic regression analysis is most appropriate to estimate the probability that a home is burglarized given the relative rewards and risks involved in the crime. The dependent variable is scored a one when the home has been burglarized and a zero if it has not been burglarized. The estimated model takes the form:

$$\text{Prob (burglary)} = 1 / (1 + e^{-z})$$

where,

$$Z=B_0 + B_1 X_1 + B_2 X_2 + \ldots + B_n X_n$$

Table 1 lists the results of the parameter estimates and the odds ratios of the multivariate logistic regression (for a brief explanation of the odds ratio, see Appendix A). The variables are grouped into two categories: First, the site characteristics the household can change in the short term without moving from his/her residence (e.g., security precautions). Second are those variables that cannot easily be changed. These variables usually require a change in residence (e.g., value of home) to be altered. Notice that the burglar from the street can observe the first four site-variables and appear significant.

The last three site variables can only be noticed on closer inspection of the home once the decision to enter the home has been made. The coefficients of these three variables are insignificantly different from zero at the .05 level. Other recent research also revealed the ineffectiveness of these final three popular means of home security (O'Shea, 1999). On the other hand, the first four factors that can be observed from the street while a burglar is pondering whether or not to enter the house are highly significantly related to whether or not the home is burglarized.

Locational and socioeconomic variables that cannot be changed within reason once a home has been purchased are all significantly related to whether a home is burglarized at the .05 level or higher. The first three factors are highly significant at the .001 level. The first is the value of the home. The more expensive the home, the more likely it is to be burglarized. This is consistent with the idea that a burglar chooses the home within a

neighborhood that he believes contains the most valuable items. Houses located on dead-end streets are less likely to be burglarized. This also is consistent with findings that the more avenues of egress there are to a home; the more likely it will be burglarized (Bevis and Nutter, 1977; Beavon, 1984). This is true also for commercial burglaries (Hakim and Shachmurove, 1996).

There is some debate whether households containing children are more or less vulnerable to residential burglary. On the one hand, it is believed that the more children in the house, the more vulnerable to burglary since the children will have friends over to visit. The more people who are familiar with the home, especially in the crime prone years of 15-24, the more likely one of them would victimize it. The alternative hypothesis is that in a very wealthy community, local youth are less likely to be engaged in burglary. Therefore, the more children there are in a household, the less likely the wife is working outside the home and the more likely someone will be guarding the home during most hours of the day. Since burglars prefer to avoid occupied homes, then the chance of burglary is lower when there are children in the home (Cohen and Felson, 1979). Our findings for wealthy Greenwich support the alternative hypothesis; the more children there are in a household, the more hours of the day the house is expected to be occupied, and the less attractive such a home is to burglars.

Finally, the last four locational and socioeconomic factors are significantly associated with whether or not a house has been burglarized at the .05 level and contain the hypothesized sign. Single-family homes are more likely to be burglarized than twins, condos, or apartments. This finding is expected since single homes are easier targets than other more dense forms of housing where neighbors can watch and notice a break-in. This is in contrast to Shover (1996) who found that burglars are more likely to burglarize multiunit dwellings without access to security. The difference may be that multiunit structures in wealthy communities like Greenwich are better secured.

Past research illustrates that houses close to a highway exit, corner houses, houses bordering on wooded areas or playgrounds, and recently occupied homes are more vulnerable to burglary than their counterparts (Rengert and Wasilchick, 1985; Shover, 1996). These factors are well established in the literature and our findings are consistent with these past findings. Therefore, we will not discuss these variables further.

To this point, we have discussed the expected relationship of each independent variable to residential burglary and examined each with our data from Greenwich. An alternative approach is to create "profiles of factors" related to the relative security of a home to determine the characteristics of particularly vulnerable homes compared to the characteristics of homes less vulnerable to burglary. These bundles of characteristics can be altered slightly to deter the importance of each factor to the bundle. We begin the analysis by computing the worse case scenario. This is the profile of factors, which leads to the highest probability of burglary. Then, we will subtract out the effect of each factor in turn by setting its value to its mean value, beginning with the one that decreases the odds of burglary the most.

Given our bundle of factors, the highest probability of burglary (.712) is when a house is: relatively expensive, is a detached single family home located within a quarter of a mile of an exit from a major thoroughfare. It is not located on a dead-end street, is a corner house, and does not have a burglar alarm. Further, it is adjacent to a wooded area or a playground, does not contain a motion sensor or timer to turn lights on and off at night, and does not normally have a car parked in the driveway. A neighbor does not pick up mail and newspapers when residents are away from the home. All of these factors are consistent with the literature to predict a high likelihood of residential burglary.

The question now is which factor lowers the odds ratio the most if its statistical influence is removed by setting its value to its mean value. The odds ratio is defined as follows: odds = P / (1-P), where P is the probability of burglary (see Tables 1-4 and the appendix). For very low incidence rates, the odds ratio is an acceptable estimate of the relative risk. The factor that most greatly lowers the odds ratio is having a burglar alarm installed in the home; a factor under the control of the homeowner at all times. If a burglar alarm is installed, the odds ratio is reduced from .712 to .578 that is a reduction of .134 (see Tables 2 and 3). Or, the value of the odds ratio suggests that just the existence of alarm diminishes the probability of burglary by 11.9 percent. Clearly, installing a burglar alarm has the largest deterring effect when all the other factors are favorable to the residential burglar. This finding is consistent with other research that has established the importance of an alarm for home security (Hakim, Rengert and Shachmurove, 1995; O'Shea, 1999).

The second most important factor is having a corner house, an uncontrollable factor. If the effect of this factor is removed by setting its value to the mean, the odds ratio is reduced from .712 to .607, a reduction of .105. Owning a corner house is only under the control of the homeowner at the time of purchase. Prospective homebuyers should consider the added risk of corner homes that increases the odds ratio of residential burglary by .105. In other words, just being a corner house raises the probability of burglary by 9.1 percent. Corner homes require more security precautions to overcome their adverse locational effect. This finding also is consistent with previous ethnographic studies that determined that residential burglary varies with the location of a home on a block (Rengert and Wasilchick, 1985).

The third most important factor is controllable. It is whether neighbors collect mail and pick up newspapers when the family is not home. When this effect is removed, the odd ratio drops from .712 to .616, a decrease of .096. This factor is termed a managerial precaution that any homeowner may adopt to decrease the probability of being burglarized (Hakim, 1995).

The fourth factor in importance, which is uncontrollable, is the value of the home. Relatively expensive homes are more likely to be burglarized. It is important to note that this finding may be unique to affluent suburban localities. Analysis of inner city crime incidents may produce inverse results (Rengert, 1989). If we remove the effect of the house value by setting it to its mean, the odds ratio only drops from .712 to .618, a decrease of .094. Or, homes valued at $300 thousand and more are more likely to be victimized than home valued at less than $50 thousand by 8.3 percent, ceteris paribus. Clearly, the value of the home is important but not nearly as important as the earlier three factors.

The next most important factor is having an automatic time and/or motion detector to turn exterior lights on and off. When this factor is removed, the odds ratio drops from .712 to .634, a decrease of .078. In other words, if all the other factors are positive in terms of encouraging a burglar to choose this home, adding time and/or motion detectors has the effect of dropping the odds ratio of being burglarized by about eight percent.

The next most important factor is the distance of the home from an exit from a major thoroughfare connecting Greenwich with New York City and Boston. When the effect of being within a quarter of a mile of these highway interchanges is removed, the odds ratio is

reduced from .712 to .652, a reduction of about six percent. It is advantageous to be located away from an exit from a major highway, a consideration of importance when searching for a new home to purchase.

Having a car in the driveway when no one is home is the next most important factor reducing the odds ratio from .712 to .659, a reduction of about five percent. The remaining three factors in Table 1 reduce the odds ratio about four percent each. One is a relative reward factor—a detached single family home as opposed to a twin, townhouse, or apartment.

Increasing any of the risk factors, in particular installing an alarm reduces the probability of burglary by more than the effect of any of the expected burglars' reward factors. A single home or its relative wealth suggest greater loot and are both uncontrolled by the homeowner in the short run. The effect of any such variables is significantly lower than the effect of increasing the presence of security precautions. In simple words, it is possible to reduce the probability of burglary the most by installing an alarm.

At this point, we can turn the analysis around and ask what combination of factors leads to the lowest probability of burglary. In all cases, it is the reverse of the values that are related to the highest probability of burglary. When all the factors take on values that reduce the reward or increase the risk of the burglary, the value of the odds ratio is reduced from .712 to .001; a decrease of 71 percent. In fact, when all other factors are in the direction <u>not</u> favorable to burglars, the change of any one factor does not raise the odds ratio more than .004 (see Table 4). This is very different from the analysis of the burglary prone residences in which all factors reduced the odd ratio by much more than .004. However, the most important factor in this case is a relative reward factor of whether the home is a detached single family home. When all the other factors are likely to encourage the burglar to pass on a house, a detached single family home as opposed to a twin, townhouse or apartment is the strongest attraction raising the odds ratio from .001 to .004. This factor is beyond the immediate control of the resident.

None of the other factors raise the odd ratio above .002. The next important factors are associated with the risk of burglarizing a house and are under the control of the homeowner. The first is whether the house contains a burglar alarm and the second is whether a car is normally parked in the driveway when no one is at home. However, neither

of these cases raises the odds ratio of a house being burglarized above .002. In fact, when we consider relatively secure homes, there appears a greater chance that burglars choose to target single-family homes.

When we consider relatively insecure homes, the most important controllable factor is the installation of a burglar alarm. Clearly, the packaging of various security precautions with the alarm reduces remarkably the probability of burglary. In fact, when homes are relatively safe from burglars, the removal of any one factor has little effect on their safety.

6. Summary and Conclusions

Ethnographic research with active residential burglars as well as psychological instruments administered indicate that burglars are more concerned with the relative rewards than the relative risks of their undertaking. Our study analyzed these earlier findings with emphasis on locational and site attributes of homes in the affluent suburb of New York City (Greenwich, Connecticut).

The findings indicate that when homes are relatively secure, the factor, which leads to the greatest increase in the probability of burglary, is the type of house. This is regarded as a measure of relative reward and is not directly under the control of the homeowner once a home has been purchased. Single-family detached homes are more prone to burglary than twins, townhouses or apartments in this affluent suburb. However, the increase is very small.

When homes are relatively vulnerable to burglary, a burglar alarm is the one factor that decreases the probability of burglary the most and is within the immediate control of the homeowner. An alarm reduces the probability of burglary in these insecure homes by over thirteen percent.

The highest probability of burglary of 0.712 exists when the following uncontrollable factors exist. The house is expensive, is not located on a dead-end street, is a detached single family corner home located within a quarter of a mile of an exit from a major thoroughfare, and is adjacent to woods or a playground. As controllable factors are concerned, the house does not have an alarm nor a motion sensor or timer to turn lights on and off at night, and does not normally have a car parked in the driveway. To conclude the

homeowners do not have a neighbor to pick up mail and newspapers when the house is vacant. When all these factors reverse, the probability of burglary is reduced to 0.001.

If the homeowner reverses the factors that are in his control, the probability of burglary is reduced by 50.7 percent. Just having an alarm nearly compensates for all adverse uncontrollable factors.

Finally, contrast the various risk and reward factors. Burglar alarms are a very important risk factor. Also, a reward factor of whether a house is a detached single family home rather than a twin, townhouse or apartment is somewhat important if homes are otherwise secure. Clearly, the relative value of the home which is the most direct indicator of the relative take contained within the house is not one of the most important factors in either relatively secure or insecure homes. In other words, the perspective gained from ethnographic studies of residential burglars that rewards are more important than risks does not directly translate into the types of homes they exploit in the wealthy suburb of Greenwich, Connecticut. Burglar's revealed activities indicate that indeed risks are their primary concern in choosing a house to burglarize.

References

Beavon, D. (1984). Crime and the Environmental Opportunity Structure: The Influence of Street Networks on the Pattering of Property Offenses. Master Thesis, Simon Fraser University, British Columbia, Canada.

Beccaria, C. (1764). On Crimes and Punishment. (New York: MacMillan).

Becker, G. (1968). "Crime and Punishment: An Economic Approach." Journal of Political Economy, Vol. 7, pp. 169-217.

Bennett, T. and R. Wright (1984). Burglars on Burglary. (Hampshire, England: Gower).

Bentham, J. (1967). A Fragment on Government and an Introduction to the Principle of Morals and Legislation. (Edited by W. Harrison). (Oxford: Basil Blackwell).

Bevis, C. and J. Nutter (1977). "Changing Street Layouts to Reduce Residential Burglary." Paper presented to the American Society of Criminology, Atlanta, (November).

Brantingham, P. and P. Brantingham (1984). Patterns in Crime. (New York: MacMillan Publishing).

Bursik, R. and H. Grassmick (1993). "Economic Deprivation and Neighborhood Crime Rates, 1960-1980." Law and Society Review. Vol. 27, pp. 263-278.

Buck, Andrew et al (1991). "A Von Then Model of Crime, Casinos and Property Values", Urban Studies, Vol. 28 (5): 673-686.

Cherniak, C. (1986). Minimal Rationality. (Cambridge: MIT Press).

Clarke, R. and D. Weisburd (1994). "Diffusion of Crime Control Benefits: Observations on the Reverse of Displacement." In R. Clarke (Ed.), Crime Prevention Studies Vol. 2. (Monsey, New York: Criminal Justice Press), pp. 165-184.

Cohen, L. and M. Felson (1979). "Social Change and Crime Rate Trends: A Routine Activity Approach." American Sociological Review. Vol. 44, pp. 588-608.

Cornish, D. and R. Clarke (1986). The Reasoning Criminal: Rational Choice Perspectives on Offending. (New York: Springer-Verlag).

Cromwell, P., J. Olson and D. Avary (1991). Breaking and Entering: An Ethnographic Analysis of Burglary. (Newbury Park, CA: Sage).

Deutsch, Joseph (1984). "Interjurisdictional Criminal Mobility: Theoretical Perspective". Urban Studies, Vol. 21 (4): 451-458.

Hakim, S. (1995). Securing Suburban Homes: The Greenwich Case. (Bethesda, Maryland: Alarm Industry Research and Education Foundation).

Hakim, S. (1980), "The Attraction of Property Crime to Suburban Localities: A Revised Economic Model." Urban Studies, Vol. 17 (3): 265-276.

Hakim, S. G. Rengert and Y. Shachmurove (1995) "Burglar and Fire Alarms: Costs and Benefits to the Locality", The American Journal of Economics and Sociology, Vol. 54 No. 2, pp. 145-161, April.

Hakim, S. and Y. Shachmurove (1996) "Spatial and Temporal Patterns of Commercial Burglaries: The Evidence Examined." The American Journal of Economics and Sociology, Volume 55(4), October, pp. 443-456.

LeBeau, James and Karen Vincent (1997) "Mapping It Out: Repeat-Address Burglar Alarms and Burglaries." In David Weisburd and Tom McEwen (Eds.) Crime Mapping and Crime Prevention. (Monsey, New York: Criminal Justice Press), pp. 289-310.

Katz, J. (1988). Seductions of Crime: Moral and Sensual Attractions in Doing Evil. (New York: Basic Books).

Kelling, G. and J.Q. Wilson (1982). "Broken Windows: The Police and Neighborhood Safety." Atlantic Monthly, Vol. 249, pp. 29-38.

Lipton, D., R. Martinson and J. Wilks (1975). The Effectiveness of Correctional Treatment: A Survey of Treatment Evaluation Studies. (New York: Praeger).

Martinson, R. (1974). "What Works? - Questions and Answers About Prison Reform." Public Interest, Vol. 35, pp. 22-54.

Merton, R. (1968). Social Theory and Social Structure. (New York: Free Press).

Newman, O. 1972). Defensible Space: Crime Prevention Through Urban Design. (New York: Macmillan).

O'Shea, T. (1999). "The Efficacy of Home Security Measures: Rational Calculations Of Burglary Offenders." Paper presented to The Academy of Criminal Justice Sciences, Orlando, Florida. (March).

Ross, M. (1977). Economics Opportunity and Crime. (Montreal: Renouf Publishing).

Reiss, A. (1986). "Why Are Communities Important in Understanding Crime?" In A. Reiss and M. Tonry (Eds.), Communities and Crime. (Chicago: University of Chicago Press), pp. 1-34.

Rengert, G. (1989). "Spatial Justice and Criminal Behavior." Justice Quarterly. Vol. 6, No. 4, pp. 543-564.

Rengert, G. and J. Wasilchick (1985). Suburban Burglary: A Time and A Place for Everything. (Springfield, IL: Charles Thomas).

Rengert, G. and J. Wasilchick (1989). Space, Time, and Crime: Ethnographic Insights Into Residential Burglary. Final Report to The National Institute of Justice. Washington, D.C.

Rushton, G. (1969). "Analysis of Spatial Behavior By Revealed Space Preference." Annals of the American Association of Geographers. Vol. 59, pp. 391-400.

Shover, N. (1996). Great Pretenders: Pursuits and Careers of Persistent Thieves. (Boulder: Westview Press).

Tunnell, K. (1992). Choosing Crime: The Criminal Calculus of Property Offenders. (Chicago: Nelson-Hall).

Wilson, J.Q. (1975). Thinking About Crime. (New York: Basic Books).

Wright, R. and S. Decker (1994). Burglars on the Job: Streetlife and Residential Breakins. (Boston: Northeastern University Press).

Wright, R., R. Logie and S. Decker (1995). "Criminal Expertise and Offender Decision-Making: An Experimental Study of the Target Selection Process in Residential Burglary." Journal of Research in Crime and Delinquency, Vol. 32, pp. 39-53.

Table 1: Logistic Regression Results

Site Variables	**Parameter Estimates**	**Odds Ratio**
Burglar Alarm	-1.3563***	.258
Car in Driveway	-0.8965***	.408
Timer and /or Motion Sensor	-0.7873***	.455
Neighbors Collect Mail and Newspapers	-0.7081***	.493
Dog in Household	-0.1807	.835
Deadbolt Locks	0.0572	1.059
Radio or Television Timer	0.1459	1.157

Location and Socioeconomic Variables	**Parameter Estimates**	**Odds Ratio**
Located on Dead-End Street	-0.5926***	.553
Value of House	0.3137***	1.369
Children in Household	-0.4442***	.641
Single Family Home	1.4788*	4.388
Borders on Wooden Area or Playground	0.3357*	1.399
Distance from Highway Exit	-0.0278*	.973
Corner House	.5271*	1.694
Year Moved to Presant House	-0.0088*	.991

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

Table 2: Profiles of Vulnerable Homes

Factor Removed From Odds Ratio	All Factors Included	Odds Ratio When Factor Removed	Reduction in Odds Ratio
1. All Factors Included	0.712	N/A	N/A
2.No Burglar Alarm	0.712	0.578	0.134
3. A Corner House	0.712	0.607	0.105
4. Neighbors Don't Collect Mail or Newspapers	0.712	0.616	0.096
5. Relatively Expensive Home	0.712	0.618	0.094
6. No Timer or Motion Sensor	0.712	0.634	0.078
7. Close to Highway Exit	0.712	0.652	0.06
8. No Car in Driveway	0.712	0.659	0.053
9. House Borders Wooded Area or Playground	0.712	0.672	0.04
10. Not Located on Dead End Street	0.712	0.673	0.039
11. Single Family Home	0.712	0.674	0.038

Table 3: Percent Changes in Probabilities

	Odds Ratio 1	Odds Ratio 2	Difference	Probability 1	Probability 2	Percent Change in Probability
1.	0.712	0.712	0	0.416	0.416	0
2.	0.712	0.578	0.134	0.416	0.366	11.927
3.	0.712	0.607	0.105	0.416	0.378	9.177
4.	0.712	0.616	0.096	0.416	0.381	8.344
5.	0.712	0.618	0.094	0.416	0.382	8.160
6.	0.712	0.634	0.078	0.416	0.388	6.704
7.	0.712	0.652	0.06	0.416	0.395	5.101
8.	0.712	0.659	0.053	0.416	0.397	4.487
9.	0.712	0.672	0.04	0.416	0.402	3.360
10.	0.712	0.673	0.039	0.416	0.402	3.274
11.	0.712	0.674	0.038	0.416	0.403	3.188

Table 4: Profiles of Less Vulnerable Homes

Factor Removed From Odds Ratio	All Factors Considered	Odds Ratio When Factor Removed	Reduction in Odds Ratio
All Factors Indicate a Secure Home	0.001	N/A	N/A
Twin, Townhouse or Apartment	0.001	0.004	0.003
Burglar Alarm	0.001	0.002	0.001
Car in Driveway	0.001	0.002	0.001
Relatively Inexpensive Home	0.001	0.001	0.000
Timer and/or Motion Sensor	0.001	0.001	0.000
Located on a Dead-end Street	0.001	0.001	0.000
Neighbors Collect Mail and Newspapers	0.001	0.001	0.000
Does Not Border on Wooded Area Or Playground	0.001	0.001	0.000
Distant Location From Highway Exit	0.001	0.001	0.000
Not a Corner House on the Block	0.001	0.001	0.000

Appendix A: The Odds Ratio

Suppose that we want to determine if people with a corner house are more likely to have had their house burglarized. One experimental design used to answer this question is called a case-control design. As the name implies, one starts with cases where houses have been burglarized. Then pick a control, which are houses that have not been victimized. The houses of the cases and controls are then classified as being on a corner or a non-corner house. To demonstrate, the data below provides a hypothetical example that exhibits some features of a case-control study:

		OUTCOME		
		Case	Control	
Corner House	Yes	50	20	70
	No	100	130	230
		150	150	

Inspection of the above table shows a higher percentage of Cases being corner houses than Controls. The odds of a Case being a corner house is 50/100. The odds of a Control being a corner house is 20/130. Therefore, the odds ratio is given by:

$$\frac{50/100}{20/130} = \frac{.5}{.155} = 3.25$$

The Odds Ratio is defined as Odds = P / (1-P) where P is the probability. Solving for P, we get: P = Odds / (1+Odds). For example, based on Table 1, the odds ratio for having a burglar alarm is 0.258. Thus, P is equal to 0.205, since 0.258 = P / (1-P).