*Journal of Investigative Psychology and Offender Profiling*
*J. Investig. Psych. Offender Profil.* **3**: 139–155 (2006)
Published online 1 November 2006 in Wiley InterScience (www.interscience.wiley.com). **DOI**: 10.1002/jip.49

# Co-offending and the Choice of Target Areas in Burglary

WIM BERNASCO*
*Netherlands Institute for the Study of Crime and Law Enforcement (NSCR)*

*Abstract*

*Using data on residential burglaries and residential burglars in The Hague, this study addresses the issue of whether solitary offenders choose their target areas differently from the way offender groups do. It is hypothesised that, in general, burglars are attracted to neighbourhoods that are nearby their homes, nearby the city centre, affluent, physically accessible, and characterised by social disorganisation. In addition, differences between solitary burglars and co-offending burglar groups regarding the strength of these criteria are assessed. The results support the postulated relevance of physical accessibility and proximity to the offenders' homes for both single offenders and co-offending groups. However, solitary burglars and burglar groups seem to agree on what constitutes an attractive target area, because no evidence for the postulated differences between them is found. Copyright © 2006 John Wiley & Sons, Ltd.*

**Key words:** target selection; burglary; co-offending; journey-to-crime; distance decay

Although substantial progress has been made in theoretical research on co-offending (Weerman, 2003), empirical research on the causes and consequences of co-offending appears to be relatively scarce. Already a decade ago Kleemans (1996, pp. 116–117) addressed the lack of knowledge regarding the role of co-offending in spatial target selection by burglars. Do solitary burglars choose different target areas than offender groups? And if so, are these differences related to the features of potential targets such as value, accessibility, supervision, and visibility? Are they also related to the areas where solitary offenders and offender groups perform their routine activities, in particular their areas of residence?

This paper attempts to contribute to understanding these issues. It reports on an empirical study addressing the effects of co-offending on the choice of target areas by burglars, and aims to answer two questions. The first is the question as to which criteria burglars use in choosing an area for committing a burglary. The second question is whether burglar groups use other location choice criteria than solitary burglars.

*Correspondence to: Wim Bernasco, Netherlands Institute for the Study of Crime and Law Enforcement (NSCR), P.O. Box 792, NL-2300AT Leiden, the Netherlands.
E-mail: WBernasco@nscr.nl

The first question has been the subject of numerous studies, including recently Bernasco and Nieuwbeerta (2005), but scarcely any attention has been devoted to the second question. As a matter of fact, most studies that address criminal location choice do not make a distinction at all between solitary offenders and groups; most studies analyse crimes committed by groups as if they had been committed separately by each of the offenders involved.

## THEORY AND PREVIOUS RESEARCH

In developing a theoretical framework that could help answer these questions, the initial focus will be on general issues of criminal location choice in burglary. Subsequently, I will discuss in what respect solitary offenders could be expected to choose differently from the way that offender groups choose their target areas.

### Location choice of residential burglars

Ethnographic research shows that, as compared to other types of offences, residential burglary is an offence that is often prepared for and committed in a relatively purposeful and calculated way (Bennett & Wright, 1984; Cromwell & Olson, 1991; Maguire & Bennett, 1982; Nee & Taylor, 2000; Rengert & Wasilchick, 2000; Reppetto, 1974; Taylor & Nee, 1988; Wright & Bennett, 1990; Wright & Decker, 1994). On the basis of accounts of the burglars themselves, these studies suggest that material motives dominate the decision to commit a burglary, that some planning is involved, and that burglars make a rough estimation on whether the expected revenues outweigh the effort and the risk of detection.

Johnson and Bowers (2004) describe the target search of burglars in terms of the foraging theory, a theory in behavioural ecology that explains the foraging behaviour of animals (Stephens & Krebs, 1986). The foraging theory asserts that when animals select foraging areas and food, they optimise rewards by weighting the nutrition value of a potential foraging area with the efforts and risks involved in finding, obtaining, and eating the food there. Burglars may be assumed to behave like optimal foragers, maximising their revenues by selecting neighbourhoods and dwellings that require little effort to enter, that appear to contain valued items, that appear to be unoccupied, or otherwise give the impression of little surveillance, so that the likelihood of being disturbed or apprehended there is low. This perspective from behavioural ecology is particularly useful because it combines elements of rational choice theory—the assertion that burglars maximise rewards by purposefully selecting target areas from a set of alternatives—with the notion that the actors may sometimes act impulsively and need not be necessarily aware themselves of the laws that drive their behaviour. The metaphor of foraging behaviour may even be fruitfully extended here, because the optimal foraging theory also addresses questions pertaining to solitary foraging versus flock (group) foraging in animals, questions that bear similarity to questions on solitary offending versus co-offending that are the subject matter of the present paper.

Consider a prospective burglar who searches the environment for potential targets. Even if his or her knowledge of the environment is limited, the number of potential targets is overwhelmingly large. Several authors (Brantingham & Brantingham, 1978; Brown & Altman, 1981; Cornish & Clarke, 1986) argue that burglars follow a spatially structured, sequential, and hierarchical decision process in selecting their targets. In the first stage,



**DOI**: 10.1002/jip

they select a suitable area, and only in the second stage do they start to compare potential targets and select a suitable one. This description is remarkably similar to how behavioural ecologists describe foraging behaviour. Animals typically first search for a foraging 'patch', an area where food is available or prey can be hunted. Once having arrived at the patch, individual food items are selected on the basis of nutrition value and other criteria.

Although many studies have established burglary target choice criteria of individual properties (Bennett & Wright, 1984; Nee & Taylor, 2000; Taylor & Nee, 1988; Wright & Logie, 1988), viewing criminal location choice as a sequential process implies that it makes sense to study location choice of burglars at a somewhat higher spatial level—the neighbourhood level—and to ask which features of neighbourhoods make them more likely to be chosen by burglars as their working sites. Thus, the location selection process starts with a set of implicit or explicit rules regarding which areas are suitable for burglary and which areas are not. The ethnographic literature referenced above suggests that three general criteria play a role when burglars compare the features of alternative areas.

The first criterion is the attractiveness of a neighbourhood in terms of prospective profitability of a burglary if it is successful. It is asserted that, other things being equal, affluent neighbourhoods are preferred over poor neighbourhoods because the expected proceeds of the offence tend to be larger there. Residential units have visible cues that signal their value and thus the prosperity of their occupants. The size and the level of maintenance of properties, the brands of cars parked in the area, and other signs reflecting the lifestyles of the residents are indicators of affluence. In this paper, we use the average value of properties in a neighbourhood, the average annual income per person, and the percentage of owner-occupied properties as indicators of a neighbourhood's affluence.

Another criterion for choosing an area could be the estimated *risk of detection* and arrest. This risk depends on the presence of effective social control in the area. Kleemans (1996, pp. 79–92) distinguishes physical and social aspects of surveillance and control. Physical aspects refer to the architectural features of properties and their surroundings (visibility from the street, lighting, ease of illegal entry, whether there is a back alley). In general, areas with a high proportion of single-family houses would be attractive for burglars, because they can be entered directly from the street, and because they often have multiple access points. Unless they live in the same building, terraced properties and flats are typically more difficult and more risky to enter for burglars. There are normally more locked doors that have to be opened before private property is entered, and there is usually only one (relatively long) way to exit the building.

Although crucially important for burglars, the physical accessibility of properties alone is not enough for a successful burglary. In fact, social accessibility may be more decisive. Starting with the classic work of Shaw and McKay (1942), an extensive literature on neighbourhood characteristics and crime has documented that neighbourhoods that lack social cohesion and social control tend to have high rates of all types of crime (Bursik & Grasmick, 1993; Miethe & McDowall, 1993; Morris, 1958; Rountree & Land, 2000; Rountree, Land, & Miethe, 1994; Sampson & Groves, 1989; Sampson, Raudenbush, & Earls, 1997; Sampson & Wooldredge, 1987; Skogan, 1990; Smith & Jarjoura, 1989; Velez, 2001). Such 'socially disorganised' neighbourhoods are attractive to offenders because the anonymity implies a lower level of territoriality (Brown & Altman, 1981). Neighbourhood residents who are not affiliated with their neighbours will generally be less easily alarmed by suspect situations, and even if they are alarmed, will be less eager to intervene in order to protect their neighbours' properties. Two core variables that are traditionally associated



**DOI**: 10.1002/jip

with lack of social cohesion and collective efficacy are residential mobility and ethnic heterogeneity (Sampson & Groves, 1989). Both variables appear to capture quite well the increased likelihood of a successful burglary in anonymous environments, because both high residential mobility and high levels of ethnic heterogeneity are conditions that provide relatively few opportunities for neighbourhood residents to get to know each other and integrate (Sampson & Groves, 1989; Sampson *et al*., 1997).

A third criterion that is likely to affect the choice of a target area for burglary is travel distance. Like most people, burglars have a limited mobility, and it has been shown that most offenders commit their offences close to their homes (Baldwin & Bottoms, 1976, pp. 78–98; Gabor & Gottheil, 1984; Hesseling, 1992; LeBeau, 1987; Phillips, 1980; Ratcliffe, 2003; Snook, 2004; Van Koppen & Jansen, 1998; Wiles & Costello, 2000), although the average distance travelled varies across types of offences (Baldwin & Bottoms, 1976; Boggs, 1965; Capone & Nichols, 1976; Gabor and Gottheil, 1984; Hesseling, 1992; Pettiway, 1982; Rhodes & Conly, 1981) and across types of offenders (Baldwin & Bottoms, 1976; Canter & Larkin, 1993; Gabor & Gottheil, 1984; Phillips, 1980; Snook, 2004; Van Koppen & Jansen, 1998; Wiles & Costello, 2000). These findings could be interpreted either as an attempt to minimise travel time (travel can also be risky, especially when carrying stolen items) or as an indication that burglars have a limited knowledge of their environment and are reluctant to take the risk to travel to and commit crimes in unknown territory (Van Koppen & De Keijser, 1997).

Neighbourhoods in the city centre or its close proximity have concentrations of public facilities. This area will thus be familiar to many prospective burglars, and will also contain many facilities, such as restaurants, bars, and clubs, that could serve as meeting points for offender groups. Therefore, proximity to the city centre could be a criterion for selecting a neighbourhood for burglary (Bernasco & Nieuwbeerta, 2005; Kleemans, 1996, pp. 92–96).

Animals looking for a good foraging patch have to simultaneously weight the quality of the patch, the distance to it, and the risk of predators being present. Burglars searching for a good target area have to simultaneously assess the area's affluence, its physical accessibility and level of social organisation, its distance from their home, and its distance from the city centre. Whilst this must be a complex task, there is some evidence that indeed offenders make trade-offs between criteria. For example, it has been found that larger travel distances to crime sites are associated with higher (potential) profits of robbery (Capone & Nichols, 1975; Van Koppen & Jansen, 1998) and burglary (Snook, 2004), which suggests that offenders make trade-offs between distance and potential profits.

Summarising the arguments discussed above leads to the general hypothesis, that the probability of a motivated offender choosing a neighbourhood as target area increases with the

(1) affluence of the neighbourhood;
(2) physical accessibility of the properties in the neighbourhood;
(3) social disorganisation of the neighbourhood;
(4) proximity to the burglar's home neighbourhood; and
(5) proximity of the neighbourhood to the city centre.

These theoretical notions and hypotheses do not distinguish between solitary offenders and co-offending groups. Without additional theoretical development, this would imply that groups select their target areas the same way that solitary offenders do, although



**DOI**: 10.1002/jip

hypothesis 4 is not specific enough for offender groups, as there may be multiple home neighbourhoods involved.

### Differences between solitary offenders and offender groups

For each of the elements of the target area selection model, the question as to whether there are reasons to suppose that solitary burglars will choose different areas than burglar groups will be addressed. With the exception of some ideas discussed by Kleemans (1996, pp. 115–117) and a few empirical results from journey-to-crime studies, we are entering unexplored territory here.

One feature that distinguishes burglar groups from solitary burglars is that they should be able to carry larger and more stolen items out of the property. Although for obvious reasons burglars in general prefer money, jewellery, and other small valuables, we might expect that affluent neighbourhoods have a stronger attraction for burglar groups than to solitary offenders.

On the issue of accessibility, it may be useful to again distinguish between physical accessibility and social disorganisation. Social organisation has been associated with neighbourhood social control and local residents keeping an eye on their environment. Arguably, the risk for an offender of being identified as an intruder and of being disturbed in the act and arrested is relatively high in neighbourhoods with a high level of social organisation. As the eye is more easily drawn to groups of unknown people than to a single person, it may be hypothesised that social disorganisation is a more important choice factor for burglar groups than for solitary offenders.

Physical accessibility, however, applies to the ease and speed of entering and leaving a property. That aspect could be less important for groups than for individuals, because co-offending makes it easy to divide tasks—for example, to have one person enter the property and have another person to stay outside on the watch. The possibility of dividing tasks would thus appear to make the importance of quick and easy access less urgent.

On the basis of the assumption (which cannot be tested here) that offender groups will often start a burglary trip from a meeting point in the city centre (and that solitary offenders will more often start from their homes), it could be expected that the proximity to the city centre is a more important target area choice criterion for burglar groups, and that distance to the home neighbourhood of the burglar is more important for solitary burglars.

The last hypothesis could further be elaborated regarding the issue of what actually is the 'proximity to the home neighbourhood' of a group of burglars. If the interpretation of distance is in terms of minimising total travel, then the mean distance of all group members would be relevant. However, a very good reason for burglars to prefer burgling close to home is to minimise the risk of detection after the burglary is completed. Thus, the relevant distance for burglar groups is the shortest distance back to the home of any group member. To summarise these arguments, the following hypotheses have been formulated:

(6) affluence is more important for burglar groups;
(7) physical accessibility is more important for solitary burglars;
(8) social disorganisation is more important for burglar groups;
(9) proximity to the city centre is more important for groups; and
(10) proximity to home is more important for solitary burglars than maximum proximity (minimum distance of any group member) is for burglar groups.



**DOI**: 10.1002/jip

Whilst the general location choice hypotheses 1–5 have been previously tested in various ways (Bernasco & Nieuwbeerta, 2005; Kleemans, 1996; Rengert, 1981; Smith, 1976), the remaining hypotheses 6–11 have never before been addressed.

In ending this section, it should be emphasised which issues are not addressed and are thus taken for granted. First, the research does not answer the question why people burgle; it does not study how the motivation to burgle emerges and develops. Thus, the existence of a sufficient level of criminal motivation is assumed throughout. Second, the analysis does not attempt to explain why some burglars work on their own and some burgle in groups (and still others sometimes work on their own and sometimes in a group). The focus is thus exclusively on the issue of how target neighbourhoods for burglary are chosen, not on why and how offender groups are formed.

## DATA AND ANALYTICAL STRATEGY

### Burglaries, burglars, and distances

To test the hypotheses, data were used that pertain to all detected residential burglaries committed by burglars living in the city of The Hague, the Netherlands, in the period 1996–2004. The Hague is situated at the coast of the North Sea. With a population of about 440,000, it is the third largest city in the Netherlands. The Hague comprises of 89 residential neighbourhoods. The average neighbourhood has an area of 0.65 square kilometres, is the home to 4952 residents and contains 2380 residential units. The geometric positions of the 89 residential neighbourhoods are displayed in Figure 1.

Data on residential burglaries were obtained from the police force that services the greater The Hague area. The police register all (attempted and completed) burglaries that are officially brought to their attention by victims, by bystanders, or by police officers

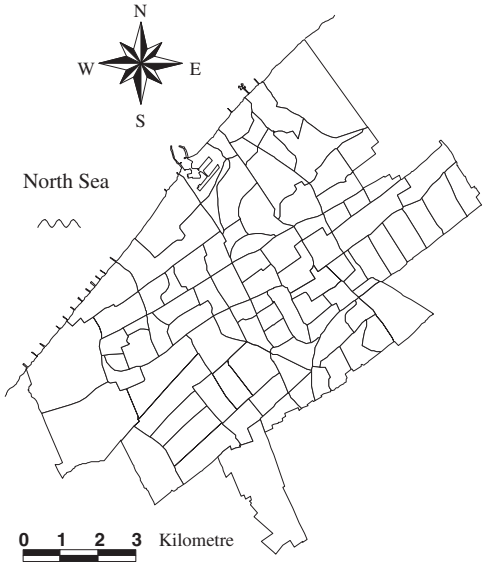


Figure 1. Neighbourhoods of The Hague, the Netherlands.



**DOI**: 10.1002/jip

themselves. The information system contains information on characteristics of the burglary committed, including the address where the burglary took place and the date and time (windows). If an offender is detected and arrested, the system also contains some characteristics of the offender, including sex, age, address, and country of birth. The unique crime incident number links offenders who have been involved in the same incident.

The detection rate for residential burglary in The Hague is 7%. This is a low rate, but not much lower than the detection rates reported elsewhere. For example, the average burglary detection rate is 12% for England and Wales, including the London Region (Simmons & Dodd, 2003: pp. 122), and 10% in Canberra, Australia (Ratcliffe, 2003).

From the police records, all persons who had been arrested at least once for being involved in a residential burglary during the years 1996–2004 were selected ($n = 1974$). Because the analysis requires that not only characteristics of the target neighbourhood are available, but also that the residential neighbourhood of the burglar is identified, it proved necessary to utilise data on burglaries committed in the city of The Hague committed by offenders living in The Hague. For burglar groups, this required that all members of the co-offending group (most often a pair of two) lived in The Hague.

Table 1 documents the subsequent steps taken to arrive at the set of 1174 residential burglaries that involved 750 offenders. Table 2 shows that the large majority of burglaries (70%) is committed by solitary offenders, whilst from Table 3 we learn that less than 30% of the offenders were arrested more than once during the study period, either as a solitary offender or as member of a co-offending group.

Table 1. Selection of burglars and burglaries

| Selection criterion | Persons* | Burglaries† |
|---|---|---|
| Cleared burglaries in period 1996–2004 | 1974 | 3408 |
| Involving persons with known address | 1881 | 3264 |
| Involving at least one person from The Hague | 1078 | 1642 |
| Burglaries at a known address | 1070 | 1628 |
| Burglaries in greater The Hague area | 1054 | 1586 |
| Burglaries in city of The Hague | 832 | 1174 |
| Burglars from The Hague | 750 | 1174 |

*Number of persons involved in one or more residential burglaries.
†Number of residential burglaries involving at least one of the persons.

Table 2. Burglaries by number of involved offenders (including offenders living outside The Hague)

| Offenders | Frequency | Percentage |
|---|---|---|
| One offender | 809 | 68.9 |
| Two offenders | 257 | 21.9 |
| Three offenders | 60 | 5.1 |
| Four offenders | 29 | 2.5 |
| Five offenders | 12 | 1.0 |
| Six offenders | 5 | 0.4 |
| Seven offenders | 1 | 0.1 |
| Eight offenders | 1 | 0.1 |
| Total | 1174 | 100 |



**DOI**: 10.1002/jip

Table 3. Burglars by number of burglaries committed

| Burglaries | Frequency | Percentage |
|---|---|---|
| 1 burglary | 535 | 71.3 |
| 2 burglaries | 104 | 13.9 |
| 3–5 burglaries | 61 | 8.1 |
| 6–10 burglaries | 28 | 4.5 |
| 11 or more burglaries | 16 | 2.1 |
| Total | 750 | 100 |

Table 4. Spatial relation of home neighbourhoods of burglar pairs. Frequency, percentage, and significance of observed–expected (Obs/exp) ratio[†]

| Spatial relation | Frequency | Percentage | Obs/exp |
|---|---|---|---|
| Equal (same neighbourhood) | 30 | 16.9 | 5.9*** |
| Adjacent (cross one border) | 26 | 14.6 | 1.6** |
| Semi-adjacent (cross two borders) | 40 | 22.5 | 1.3* |
| Further away | 82 | 46.1 | 0.6 |
| Total | 178 | 100 | |

[†]The observed–expected ratio is the ratio of the observed frequency and the expected frequency under a scheme that randomly matches offenders involved in burglary co-offending. Significance is calculated using permutation tests with 999 random permutations (***$p < 0.001$, **$p < 0.01$, *$p < 0.05$).

To establish the number of offenders, we matched all offenders who were listed as suspects of burglary and had a corresponding police report number, in addition to being reported for a burglary at the same day, time, and address. Multiple burglaries at the same address on the same day or in the night after the day were removed, so that only one burglary at the same address on the same day was included.

Each residential burglary and each offender address was assigned to one of the 89 residential neighbourhoods of The Hague. The offender address is the most recent address known to the police at the end of the year the burglary occurred. This will typically be the home address valid at the time of the burglary, but in the exceptional case that a burglar had a change of address between multiple burglary arrests during the same year, only the address at the time of the last arrest during that year is kept in the registration.

Table 4 presents the spatial relations that exist between the home neighbourhoods of the 178 burglar pairs in the data, that is, the pairs in which both co-offenders lived in The Hague. Contrary to what might be expected, co-offenders do not seem to recruit each other exclusively from the local neighbourhood environment. Only 17% of burglar pairs live in the same neighbourhood, another 15% live in adjacent neighbourhoods (which could be the case if they live on the opposite side of the same street), whilst 23% live two neighbourhood borders away from each other. In order to test whether this distribution represents a statistically significant tendency to choose burglary partners that live close nearby, a permutation test was performed (for a general introduction to permutation or randomisation tests, see Edgington (1995). In the test, the distribution in Table 4 is not compared to a theoretical distribution, but to a distribution generated by repeatedly matching each burglar at random to another (co-offending) burglar in the data, and calculating the



**DOI**: 10.1002/jip

distance (in terms of boundaries to be crossed) between their home neighbourhoods. The mean of that distribution is the expected value, in this case, the expected number of burglary pairs living in the same neighbourhood, under the null hypothesis of random recruitment of burglary partners. If, after 999 replications, we still have not found one distribution with more than 30 pairs living in the same neighbourhood, we conclude that there is a significant ($p < 0.001$) tendency to recruit burglary partners from the own neighbourhood. From the last column of Table 4 we learn that indeed there is a clear tendency for local recruitment, because more pairs from the same, adjacent, and semi-adjacent neighbourhoods are observed than expected. The same analysis, obviously with more complex classifications of the spatial relations, was performed for groups of three and of four co-offenders, with results very similar to those of pairs (details can be obtained from the author).

For each burglar–burglary combination, the distance between the offender home and the crime site was calculated using the centroids of both neighbourhoods. If the offender committed the burglary in his or her own neighbourhood, the distance was estimated using the formula $D_{ii} = 1/2\sqrt{O}$, in which $O$ is the neighbourhood area in square kilometres (also see Bernasco & Nieuwbeerta, 2005; Ghosh, 1951). The reason for calculating the distance between home address and burglary address by approximation (neighbourhood centroids distances) rather than as an exact distance is that the model to be introduced below requires us to compare the distances between the home of the burglar and all potential target neighbourhood in the study area. To be consistent, it was decided that the distance to the actually chosen target neighbourhood should be measured in the same way (with the same measurement error) as the distance to non-chosen potential target neighbourhoods.

Figure 2 displays the distribution of the length of the crime trips of solitary offenders and of offender groups. For offender groups, both the mean and the minimum distance are displayed (the minimum distance is the shortest distance of any group member's home neighbourhood to the target neighbourhood). Burglars co-offending with offenders not living in The Hague are included as co-offenders, but their partners from outside The Hague are not included in the distance calculations. The distributions of both solitary offenders and offender groups show a distance decay pattern. Clearly the distance decay pattern of solitary offenders is very similar to the 'minimal distance' of offender groups, which suggests that the outcome of a group's decision on where to commit a burglary is not some geographical midpoint, but tends to be nearby the anchor point of at least one group member.

In order to consider the special role that the offender's own neighbourhood could take, a dichotomous variable was created, indicating for a potential crime destination neighbourhood whether the offender lived there. A neighbourhood's distance to the city centre is calculated as the distance to the *Zuidwal* neighbourhood. Located between the two main railway stations of The Hague, this neighbourhood and the area in its direct vicinity include the city hall, a number of government offices, and a concentration of shops, restaurants, and theatres. In the multivariate analyses, all distances measured were transformed into proximity measures by changing their signs.

## Neighbourhood characteristics

The theoretical neighbourhood characteristics potential profits, physical accessibility, and social disorganisation have been operationalised using data from the information system



**DOI**: 10.1002/jip

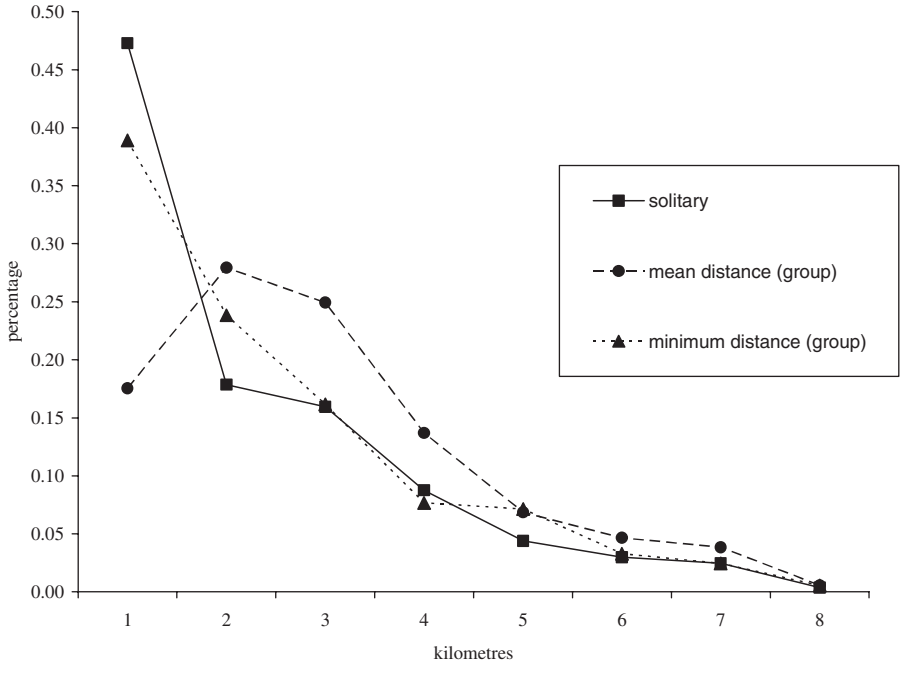


Figure 2. Distance between burglary target neighbourhood and home neighbourhood of solitary burglars, and mean and minimum distances of offender groups ($n$ = 1174 burglaries, 809 solitary, and 365 group burglaries).

*Swing The Hague*, a system managed by the Office of Urban Development of the city. Descriptive neighbourhood statistics are displayed in Table 5, and their correlations in Table 6.

The affluence of neighbourhoods is measured by the average value of residential properties in the neighbourhood, the percentage of owner-occupied properties, and the mean income per resident. The first two measures are taken from the real estate registration of the city of The Hague. They are available on an annual basis. The average income per resident is taken from the digital publications that Statistics Netherlands compiles biannually on all municipalities and neighbourhoods in the Netherlands.

The physical accessibility of properties in the neighbourhoods is also based on the real estate registration system of the city of The Hague. One measure is the percentage of single-family properties, defined as non-terraced properties with an access point (entry, front door) at ground level. The other measure is the percentage of terraced property, defined as terraced properties with a shared access point.

As discussed above, ethnic heterogeneity and residential mobility are used as indicators of the social disorganisation of the neighbourhood. Data on ethnic origin and residential mobility are annually available from the citizen registration of the city of The Hague. Residential mobility is the average of the percentage of residents moving into the neighbourhood and the percentage of residents moving out of the neighbourhood. Ethic heterogeneity is calculated using the index of qualitative variation (Agresti & Agresti, 1978). This index can be viewed as the probability that two random residents of the neighbourhood are of different ethnic origin. Ethnic origin is defined on the basis of the country



**DOI**: 10.1002/jip

Table 5. Average, standard deviation, minimum, and maximum of neighbourhood variables

| Variable | Mean | SD | Min. | Max. |
|---|---|---|---|---|
| Variables in the analysis | | | | |
| Average property value € 100 000 | 1.26 | 0.84 | 0.49 | 4.25 |
| Annual income per resident € 1000 | 13.17 | 3.85 | 7.03 | 25.43 |
| Percentage owner-occupied properties | 41.92 | 24.98 | 0.89 | 91.00 |
| Ethnic heterogeneity (percentage) | 37.70 | 22.90 | 2.00 | 81.33 |
| Residential mobility (percentage) | 33.85 | 10.24 | 12.56 | 61.05 |
| Percentage of single family properties | 17.05 | 17.56 | 0.00 | 84.33 |
| Percentage of terraced properties (shared entrance) | 63.17 | 26.44 | 3.78 | 98.51 |
| Distance to city centre (kilometres) | 3.00 | 1.47 | 0.63 | 6.99 |
| Background variables | | | | |
| Annual number of burglaries per 100 properties* | 2.07 | 1.01 | 0.54 | 4.99 |
| Area (square kilometres) | 0.65 | 0.51 | 0.13 | 3.18 |
| Number of residents | 4944 | 3243 | 353 | 14 927 |
| Number of properties | 2401 | 1452 | 212 | 7 494 |

The Hague ($n = 89$), excluding three non-residential neighbourhoods and two neighbourhoods with less than 200 properties. values displayed are averaged over the full period 1996–2004.
*Reported to the police (including unsolved cases)

Table 6. Correlations between neighbourhood variables in the analysis ($n = 89$)

| Variable | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| A. Property value | 1 | | | | | | |
| B. Annual income per person | 0.81 | 1 | | | | | |
| C. Owner-occupied property | 0.64 | 0.64 | 1 | | | | |
| D. Ethnic heterogeneity | –0.53 | –0.73 | –0.64 | 1 | | | |
| E. Residential mobility | –0.27 | –0.39 | –0.36 | 0.70 | 1 | | |
| F. Single family properties | 0.71 | 0.42 | 0.50 | –0.41 | –0.27 | 1 | |
| G. Terraced property | –0.54 | –0.29 | –0.45 | 0.30 | –0.06 | –0.71 | 1 |
| H. Proximity to city centre | 0.08 | 0.19 | 0.14 | –0.57 | –0.21 | 0.28 | 0.04 |

Correlations are calculated on the basis of averages over the period 1996–2004.

of birth of the person and his or her parents. If persons are born abroad, their country of birth defines their ethnicity, if they are born in the Netherlands the country of birth of their parents defines their ethnicity, such that either a father or mother born abroad defines the children ethnicity. If both parents are born abroad in different countries, the father's country of birth defines their ethnicity.

All neighbourhood variables are available for each year in the study period 1996–2004. Although neighbourhood characteristics are quite stable over a time-span of 9 years, it was ascertained that in the subsequent analysis, burglary incidents were linked to the neighbourhood characteristics of the year in which the burglary took place.

To empirically justify the creation of three theoretical variables on the basis of the seven structural neighbourhood characteristics discussed above, a factor analysis was performed.



**DOI**: 10.1002/jip

Table 7. Factor loadings on three factors (factor analysis, varimax rotation, $n = 89$)

| Variable | Factor 1 affluence | Factor 2 physical accessibility | Factor 3 social disorganisation |
|---|---|---|---|
| Property value | **0.75** | 0.52 | –0.15 |
| Annual income per person | **0.87** | 0.16 | –0.32 |
| Owner-occupied property | **0.52** | 0.39 | –0.36 |
| Ethnic heterogeneity | –0.49 | –0.20 | **0.75** |
| Residential mobility | –0.16 | 0.00 | **0.82** |
| Single family properties | 0.27 | **0.80** | –0.21 |
| Terraced property | –0.21 | **–0.81** | –0.04 |

The factor loadings of the seven variables on three factors are displayed in Table 7. They largely support the proposed theoretical structure. On the first factor we find high loadings of property value, income, and (though slightly weaker) property ownership, the three variables used to measure affluence. On the second factor, the variables indicating physical accessibility, have high loadings, and on the third factor, ethnic heterogeneity and residential mobility, the variables we use to measure social disorganisation.

To construct the three overall theoretical measures, the mean of the standardised values of the variables making up a concept were calculated, where necessary with a correction for the sign. These three variables and the two distance variables are the core elements of the choice model. The number of properties in a neighbourhood functions as a control variable: it is not a part of the theoretical model, but obviously it is part of the opportunity structure for burglary.

## Analytical strategy

Hypotheses on location choice can be very well formalised using the *random utility maximization* (RUM) approach, and with the associated statistical conditional logit model (McFadden, 1973). This approach is used to explain the outcome of choice problems in which some agent has to choose one out of a finite set of discrete alternatives, where the value of each of the alternatives depends on factors that are specified by a substantive theory. Thus, in the case of the choice of a target area for burglary, these factors would include the characteristics that make some neighbourhoods attractive for burglars, and could include the variables discussed in the theoretical paragraph above. For a more comprehensive discussion on the use of the RUM approach to criminal location choice, see Bernasco and Nieuwbeerta (2005).

The hypotheses 1–5 apply to all burglars, irrespective of whether they operate on their own or as a group. The same model can be set up to also establish whether solitary offenders differ from offender groups in terms of the weight being given to various selection criteria. This feature is highly relevant in this paper because hypotheses 6–10 precisely address this issue; the question whether a characteristic of an actor (is it a solitary burglar or a burglar group?) affects the relative importance of a selection criterion. For example, it can be assessed whether knowledge of the local environment is a more important choice criterion for solitary burglars than for groups.



**DOI**: 10.1002/jip

## RESULTS

The outcomes of estimating the choice model are presented in Table 8. The second major column of the Table, titled 'solitary offender', contains the results of a conditional logit model of neighbourhood target choice by solitary burglars. The third column applies to offender groups. The parameter estimates are multiplicative in the (conditional) probability that a neighbourhood is chosen as a target area for a burglary. For example, the value of 1.49 for proximity to the home neighbourhood means that the probability that a neighbourhood is being chosen by a burglar increases by a factor of 1.49 for every kilometre the potential target neighbourhood is situated closer to the burglar's home neighbourhood. Values above 1 thus indicate positive (probability raising) effects, and values below 0 and 1 indicate negative (probability lowering) effects.

The presented estimated standard errors are 'robust' standard errors that have been upwardly corrected to account for the dependence between observations that emerges because some offender's and some offender groups' multiple burglaries are analysed (see White, 1982).

To answer the first research question that refers to the criteria residential burglars use for selecting target areas, we assess the direction and magnitude of the effects of these criteria in the second and third columns of Table 8 ('solitary offender' and 'offender group'). The results partially support the hypotheses, because the effects of physical accessibility, proximity, and a special proximity aspect, the home neighbourhood, are all significant in the hypothesised direction, supporting hypotheses 2 and 4. The hypotheses 1, 3, and 5, however, are not supported, as the effects of affluence, social disorganisation, and proximity to the city centre, are not significant. Quite remarkable is the strong effect of the target neighbourhood being the same as the home neighbourhood of the offender, which is strong despite the fact that distance itself is already accounted for. The strong effect is partially due to the decision to set the intra-neighbourhood distance to a non-zero value

Table 8. Estimates of the conditional logit model

| | Solitary offender | | Offender group | | $\chi^2$ test difference |
|---|---|---|---|---|---|
| Variable | $e^{\beta}_{(S)}$ | z | $e^{\beta}_{(G)}$ | z | $e^{\beta}_{(S)} - e^{\beta}_{(G)}$ |
| Affluence | 0.92 | –0.80 | 0.81 | –1.48 | n.s. |
| Physical accessibility | 1.21* | 2.40 | 1.40** | 3.48 | n.s. |
| Social disorganisation | 1.07 | 0.96 | 1.11 | 0.86 | n.s. |
| Proximity home neighbourhood[†] | 1.49** | 6.47 | 1.51** | 3.02 | n.s. |
| Own neighbourhood[‡] | 15.12** | 10.32 | 7.27** | 13.11 | 0.02 |
| Proximity city center | 1.02 | 0.41 | 0.95 | –0.58 | n.s. |
| Number of properties | 1.32** | 8.93 | 1.27** | 5.36 | n.s. |

Multiplicative (odds ratio) parameters and z-values based on robust huber–white standard errors with cluster correction. In 89 target neighbourhoods, there are 1174 burglaries, involving 750 burglars in 651 clusters (unique burglar groupings).

*$p < 0.05$; **$p < 0.01$ (two-sided).

[†]The proximity of the potential burglary target neighbourhood to the home neighbourhood of a solitary offender, or the proximity to the closest home neighbourhood of an offender group member.

[‡]The potential burglary target neighbourhood is the home neighbourhood of the solitary offender or of at least one member of an offender group.



**DOI**: 10.1002/jip

(average distance between two random locations in the neighbourhood) rather than to zero, but a weaker, though still substantial, significant effect remains if we set intra-neighbourhood distances to zero. Apparently there is a strong preference for the own neighbourhood as burglary target area.

Hypotheses 5–10 refer to the second research question, which is the question whether solitary burglars and burglar groups differ in terms of the criteria used for choosing target areas. These hypotheses are tested by assessing the statistical significance of the differences between the parameter estimates of solitary offenders and offender groups in the fourth column of Table 8. The tests have been performed on all parameters, even if they were not significant in the separate models, because in principle, parameter estimates can differ significantly when both estimates separately do not differ significantly from 1. Except for the fact that solitary offenders appear to have a stronger preference for searching a burglary target in their own neighbourhood, there are no significant differences. Apparently, although the burglary act could be quite different for solitary individuals and groups, both seem to agree on the criteria that are important for choosing a target area. These criteria are proximity—with a special emphasis on the own home neighbourhood as an attractive target area—and the physical accessibility of the properties in the area.

The outcomes thus partially confirm the general theory on burglary target area choice, but they refute the postulated differences between solitary offenders and group offenders. Both categories may be more similar in many respects than we think they could be.

## DISCUSSION

Theories on criminal location choice often assume solitary offenders, or at least seldom postulate and specify differences between solitary offenders and offender groups in terms of preferred targets or target areas. In this paper a small-scale theory on burglary target area selection and on differences between solitary offenders and offender groups was developed and tested. The results of these tests partially support the general theory on burglary target area choice, but do not provide evidence for the postulated differences.

Most importantly, the results confirm the importance of the neighbourhood environment as a burglary target area for local offenders. The own neighbourhood and other nearby neighbourhoods are the most likely targets for burglary, not only for solitary burglars, but for burglar groups as well. Although these results are fairly stable, we should note that they are limited by the fact that we have not taken into account the burglaries committed by The Hague residents outside the city boundaries (about 12%).

Another criterion that appears to drive the target areas choice of burglars is the physical accessibility of the properties in the area. Neighbourhoods characterised by a low percentage of terraced properties and a high percentage of single family houses are the most popular target neighbourhoods, again both for solitary burglars and for burglar groups.

Like Bernasco and Nieuwbeerta (2005), we do not find confirmation of the hypothesis that affluent neighbourhoods are popular target areas for burglary. This could be related to the possibility that residents in affluent areas have, on average, taken more measures against burglary than elsewhere, thereby compensating for their higher attractiveness. After controlling for distance and 'own neighbourhood', we find no evidence that socially disorganised neighbourhoods attract burglars.

Some concluding remarks concerning the limits of our empirical analyses are in order. First, like all empirical work using police data on offenders, the selection of burglaries



**DOI**: 10.1002/jip

and burglars is conditional on the cases being detected by the police, and the burglary detection rate in The Hague is only about 7%, which is low, although not much lower than what is reported and subsequently analysed elsewhere. The low detection rate could bias the results if a relationship exists between criteria of location choice and the probability of arrest. For example, if the detection rate in affluent neighbourhoods would be higher than in deprived neighbourhoods, we would overestimate the effect of affluence. Separate analyses, however, show no systematic relationship between neighbourhood characteristics and burglary detection rates.

Another major issue related to the validity of the police data is whether the police information on the offenders involved in a burglary is complete. Although we can be reasonably sure that two people arrested together for the same burglary incident are indeed co-offenders, we may not be so sure that there were only two people involved, instead of three or more. Especially because a natural division of tasks in a burglary group would require not all offenders to enter the property, it may be that we seriously underestimate the number of offenders involved in burglaries, including of course the cases reported here as solitary offenders. Ethnographic research could shed some light on this issue, although the presence of non-arrested accomplices or co-offenders seems to be one of the few things that detained and convicted offenders are not very eager to talk about.

## ACKNOWLEDGEMENTS

The *Haaglanden* police force and the municipality of The Hague kindly provided data for this research. Henk Elffers, Paul Nieuwbeerta, and an anonymous reviewer provided valuable comments on previous versions of the manuscript.

## REFERENCES

Agresti, A., & Agresti, B. F. (1978). Statistical analysis of qualitative variation. In K. F. Schuessler (Ed.), *Sociological methodology* (pp. 204–237). San Francisco: Jossey-Bass.

Baldwin, J., & Bottoms, A. E. (1976). *The urban criminal: A study in Sheffield*. London: Tavistock Publications.

Bennett, T., & Wright, R. (1984). *Burglars on burglary: Prevention and the offender*. Brookfield, VT: Gower.

Bernasco, W., & Nieuwbeerta, P. (2005). How do residential burglars select target areas? A new approach to the analysis of criminal location choice. *British Journal of Criminology*, *45*, 296–315.

Boggs, S. L. (1965). Urban crime patterns. *American Sociological Review*, *30*, 899–908.

Brantingham, P. L., & Brantingham, P. J. (1978). A theoretical model of crime site selection. In M. D. Krohn, & R. L. Akers (Eds.), *Crime, law and sanctions. Theoretical perspectives* (pp. 105–118). Beverly Hills, CA: Sage.

Brown, B. B., & Altman, I. (1981). Territoriality and residential crime: A conceptual framework. In P. J. Brantingham, & P. L. Brantingham (Eds.), *Environmental criminology* (pp. 55–76). Beverly Hills, CA: Sage.

Bursik, R. J., & Grasmick, H. G. (1993). Economic deprivation and neighborhood crime rates, 1960–1980. *Law & Society Review*, *27*, 263–283.

Canter, D., & Larkin, P. (1993). The environmental range of serial rapists. *Journal of Environmental Psychology*, *13*, 63–69.

Capone, D. L., & Nichols, W. W. (1975). Crime and distance: An analysis of offender behavior in space. *Proceedings of the Association of American Geographers*, *7*, 45–49.

Capone, D. L., & Nichols, W. W. (1976). Urban structure and criminal mobility. *American Behavioral Scientist*, *20*, 199–213.

 
**DOI**: 10.1002/jip

Cornish, D. B., & Clarke, R. V. (Eds.) (1986). *The reasoning criminal. Rational choice perspectives on offending*. New York: Springer.
Cromwell, P. F., & Olson, J. N. (1991). *Breaking and entering: Burglars on burglary.* Newbury Park, NJ: Sage.
Edgington, E. S. (1995). *Randomization tests* (3rd ed.). New York: Marcel Dekker.
Gabor, T., & Gottheil, E. (1984). Offender characteristics and spatial mobility: An empirical study and some policy implications. *Canadian Journal of Criminology*, *26*, 267–281.
Ghosh, B. (1951). Random distances within a rectangle and between two rectangles. *Bulletin of Calcutta Mathematical Society*, *43*, 17–24.
Hesseling, R. B. P. (1992). Using data on offender mobility in ecological research. *Journal of Quantitative Criminology*, *34*, 95–112.
Johnson, S. D., & Bowers, K. J. (2004). The burglary as clue to the future: The beginnings of prospective hot-spotting. *European Journal of Criminology*, *1*, 237–255.
Kleemans, E. (1996). *Strategische misdaadanalyse en stedelijke criminaliteit. Een toepassing van de rationele keuzebenadering op stedelijke criminaliteitspatronen en het gedrag van daders, toegespitst op het delict woninginbraak* [*Strategic crime analysis and urban crime. An application of the rational choice approach to urban crime patterns and offender behavior, with a special focus on residential burglary*]. Enschede: Twente University.
LeBeau, J. L. (1987). The journey to rape: Geographical distance and the rapist's method of approaching the victim. *Journal of Political Science and Administration*, *15*, 129–136.
Maguire, M., & Bennett, T. (1982). *Burglary in a dwelling. The offence, the offender and the victim*. London: Heinemann.
McFadden, D. (1973). Conditional logit analysis of qualitative choice behavior. In P. Zarembka (Ed.), *Frontiers in econometrics* (pp. 105–142). New York: Academic Press.
Miethe, T. D., & McDowall, D. (1993). Contextual effects in models of criminal victimization. *Social Forces*, *71*, 741–759.
Morris, T. (1958). *The criminal area. A study in social ecology*. London: Routledge and Kegan Paul.
Nee, C., & Taylor, M. (2000). Examining burglars' target selection: Interview, experiment or ethnomethodology? *Psychology Crime & Law*, *6*, 45–59.
Pettiway, L. E. (1982). Mobility of robbery and burglary offenders: Ghetto and non-ghetto spaces. *Urban Affairs Quarterly*, *18*, 255–270.
Phillips, P. D. (1980). Characteristics and typology of the journey to crime. In K. D. Harries (Ed.), *Crime: A spatial perspective* (pp. 167–180.). New York: Columbia University Press.
Ratcliffe, J. H. (2003). *Suburb boundaries and residential burglars* (Trends and issues in crime and criminal justice no. 246, March, 2003, pp. 1–6). Canberra: Australian Institute of Criminology.
Rengert, G. F. (1981). Burglary in Philadelphia: A critique of an opportunity structure model. In P. J. Brantingham, & P. L. Brantingham (Eds.), *Environmental Criminology* (pp. 189–202). Beverly Hills, CA: Sage.
Rengert, G. F., & Wasilchick, J. (2000). *Suburban burglary: A tale of two suburbs*. Springfield, IL: Charles C. Thomas.
Reppetto, T. A. (1974). *Residential crime*. Cambridge, MA: Ballinger.
Rhodes, W. M., & Conly, C. (1981). Crime and Mobility: An empirical study. In P. J. Brantingham (Ed.), *Environmental criminology* (pp. 167–188). Beverly Hills, CA: Sage.
Rountree, P. W., & Land, K. C. (2000). The generalizability of multilevel models of burglary victimization: A cross-city comparison. *Social Science Research*, *29*, 284–305.
Rountree, P. W., Land, K. C., & Miethe, T. D. (1994). Macro-micro integration in the study of victimization—a hierarchical logistic model analysis across Seattle neighborhoods. *Criminology*, *32*, 387–414.
Sampson, R. J., & Groves, W. B. (1989). Community structure and crime: Testing social-disorganization theory. *American Journal of Sociology*, *94*, 774–802.
Sampson, R. J., & Wooldredge, J. D. (1987). Linking the micro- and macro-level dimensions of lifestyle-routine activity and opportunity models of predatory victimization. *Journal of Quantitative Criminology*, *3*, 371–393.
Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*, *277*, 918–924.
Shaw, C. R., & McKay, H. D. (1942). *Juvenile delinquency and urban areas*. Chicago: University of Chicago Press.

 
**DOI**: 10.1002/jip

Simmons, J., & Dodd, T. (Eds.) (2003). *Crime in England and Wales 2002/2003*, Home Office Statistical Bulletin 07/03. London: Home Office.
Skogan, W. G. (1990). *Disorder and decline: Crime and the spiral of decay in American neighborhoods*. New York: The Free Press.
Smith, T. S. (1976). Inverse distance variations for the flow of crime in urban areas. *Social Forces*, *54*, 804–815.
Smith, T. S., & Jarjoura, G. R. (1989). Household characteristics, neighborhood composition and victimization risk. *Social Forces*, *68*, 621–640.
Snook, B. (2004). Individual differences in distance traveled by serial burglars. *Journal of Investigative Psychology and Offender Profiling*, *1*, 53–66.
Stephens, D. W., & Krebs, J. R. (1986). *Foraging theory*. Princeton, NJ: Princeton University Press.
Taylor, M., & Nee, C. (1988). The role of cues in simulated residential burglary—a preliminary investigation. *British Journal of Criminology*, *28*, 396–401.
Van Koppen, P. J., & De Keijser, J. W. (1997). Desisting distance decay: On the aggregation of individual crime trips. *Criminology*, *35*, 505–515.
Van Koppen, P. J., & Jansen, R. W. J. (1998). The road to robbery: Travel patterns in commercial robberies. *British Journal of Criminology*, *38*, 230–246.
Veléz, M. B. (2001). The role of public social control in urban neighborhoods: A multilevel analysis of victimization risk. *Criminology*, *38*, 837–864.
Weerman, F. M. (2003). Co-offending as social exchange. *British Journal of Criminology*, *43*, 398–416.
White, H.(1982). Maximum likelihood estimation of misspecified models. *Econometrica*, *50*, 1–25.
Wiles, P., & Costello, A. (2000). *The 'road to nowhere': The evidence for traveling criminals*. London: Home Office, Research, Development and Statistics Directorate.
Wright, R. T., & Bennett, T. (1990). Exploring the offender's perspective: Observing and interviewing criminals. In K. L. Kempf (Ed.), *Measurement issues in criminology* (pp. 138–151). New York: Springer-Verlag.
Wright, R. T., & Decker, S. H. (1994). *Burglars on the job*. Boston, MA: Northeastern University Press.
Wright, R. T., & Logie, R. H. (1988). How young house burglars choose targets. *The Howard Journal*, *27*, 92–104.



**DOI**: 10.1002/jip