The Journey to Danish Residential Burglary:

Distributions and Correlates Of Crime Trips Made by Convicted Danish Offenders

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Contents

Summary

This study uses POLSAS data from the Danish National Police to examine the distributions and correlates of 3,238 trips that were made by offenders to residential burglaries nationally at six types of property during the period 1 January 2002 to 31 August 2003.

The four primary objectives of this study are:

(1) To measure the average distance separating offenders' homes and burglary offense locations;
(2) To look for and explain differences in distances traveled to burglaries at different types of residential property (e.g., single-family houses, multi-family apartment buildings, etc.);
(3) To investigate the extent to which characteristics of offenders and offences predict the distances traveled to burglary; and
(4) To examine the validity of the popular assumption that burglars favor affluent areas when seeking crime targets.

"Journey to crime" research is characterized by three important findings that are consistent across all major studies, and which are all confirmed in the Danish data:

(1) The majority of crime trips are relatively short (the Danish mode and median are 0.5 and 4.7 km, respectively);
(2) The number of crimes committed decreases with distance from an offender's residence ("distance decay");
(3) There is a "buffer zone" immediately surrounding offenders' residences within which they avoid crime commission out of concern for being recognized.

Yet crime trip patterns differ significantly by type of target, and the "average crime trip" largely misrepresents trips to specific forms of property.

Bivariate and multivariate analyses of Danish crime trips provide support for Brantingham and Brantingham's (1981) theoretical hypotheses concerning the relationships between distance traveled and offender age, gender, and cooperation with co-offenders.

The study finds little support for the notion that burglars tend to prefer targets in affluent areas - unless they come from such areas themselves. Like most crime, burglary appears to be largely an intra-area affair. While some offenders undoubtedly travel to unfamiliar areas in search of lucrative targets, the data presented in this report suggest that these individuals are the exception as opposed to the rule.

Section 1: Introduction to the Current Study and Past Research

This study examines the distances that Danish residential burglars travel to commit their crimes, and investigates the extent to which the length of these trips differs by socio-demographic characteristics of the offender and/or the type of property burgled. The study also examines the validity of the popular Danish belief that it is typical for burglars to travel from socially disadvantaged areas to wealthy suburbs in search of lucrative targets.

Do burglars travel? While some undoubtedly do, social psychological research would suggest that most would not, since offenders are generally characterized as relatively opportunistic and non-industrious (e.g., Gottfredson and Hirschi, 1990). This characterization is supported by extensive international research from the field of environmental criminology, which portrays the average "journey to crime" as relatively short and geographically-oriented towards areas with which the offender is familiar and feels comfortable (e.g., Brantingham and Brantingham, 1981). Despite the availability of first-rate registry data containing both offender and victim addresses, there are no published studies concerning Danish journeys to crime. The current report fills this gap by examining the Euclidian ("as the bird flies") distances traveled in connection with 3,238 "crime trips" made nationwide by convicted residential burglars during the 20-month period, 1 January 2002 to 31 August 2003. Victim and offender address data are derived from POLMAP, a "case steering system" used by the National Danish Police (*Rigspolitiet*). Socioeconomic data by area are measured at the postcode level and derived from Statistics Denmark.

The four primary objectives of this study are:

1. To measure the average distance separating offenders' homes and burglary offense locations;
2. To look for and explain differences in distances traveled to burglaries at different types of residential property (e.g., single-family houses, multi-family apartment buildings, etc.);
3. To investigate the extent to which characteristics of offenders and offences predict the distances traveled to burglary; and
4. To examine the validity of the popular assumption that burglars favor higher socioeconomic areas when seeking crime targets.

Journey to Crime

The phrase "journey to crime" concerns the distance that offenders travel to commit crimes, as operationally defined by the distance separating offenders' residences and their crime locations. While the catchphrase "journey to crime" has been employed for approximately 30 years, work on crime journeys goes back much further. White's (1932) pioneering investigation of 638 felonies committed in Indianapolis, Indiana, showed that most crime trips are relatively short, though the distances traveled differ by type and class of crime. Journey to crime research has laid the groundwork for geographic profiling - an investigative technique that uses what we know about the distances typically traveled to crime in order to limit the search areas used when canvassing areas for wanted offenders (for more on geographic profiling, see Rossmo, 2000).

Journey to crime research is characterized by four important findings that are consistent across all major studies:

(1) The majority of crime trips are relatively short. In a number of studies, more than 50% of both property and violent crimes were found to have occurred within 2 km of an offender's residence (e.g., Baldwin and Bottoms, 1976; Repetto, 1974, Pope 1980). This pattern appears to result from (a) a simple cost-benefit calculus in which shorter trips are generally deemed less demanding than, and thus preferable to, longer trips, and (b) the limits of the typical offender's "awareness space" - the areas around an offender's home, work or places of leisure with which he or she is familiar (Brantingham and Brantingham, 1981).

(2) The number of crimes committed decreases with distance from an offender's residence. This phenomenon has been coined "distance decay," and is common not only to crime, but to most spatial movements (trips to shopping, leisure, etc.) (Brantingham and Brantingham, 1981).

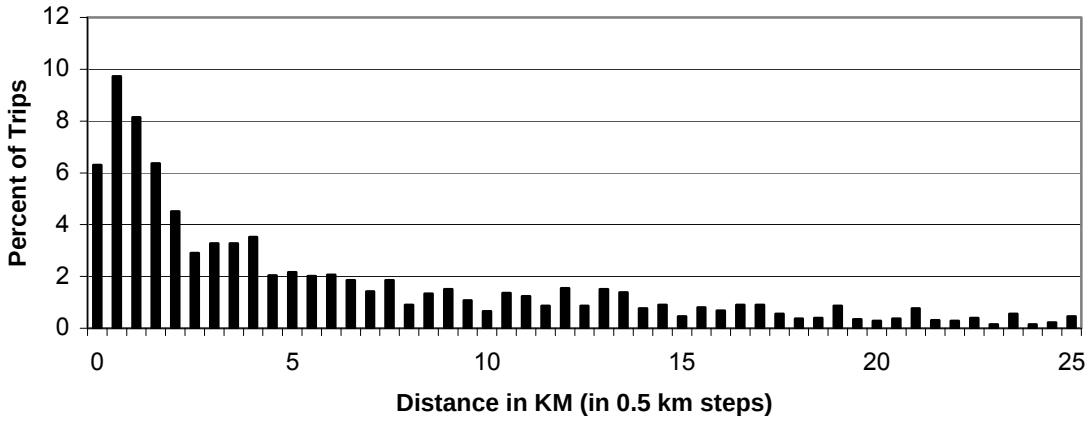
(3) There is a limited area, or "buffer zone," immediately surrounding offenders' residences within which they avoid crime commission – presumably out of a rational concern for the increased risk of being recognized.

(4) Journeys to violent crimes (e.g., rape, assault, homicide) tend to be shorter than those to property crimes (White, 1932; Reiss, 1967; Pyle 1974; Baldwin and Bottoms 1976). The difference probably arises from the fact that non-instrumental crimes, like much violence, are more likely than property crimes to arise spontaneously within the course of routine daily activities – which tend to be anchored around the home (i.e., within the "buffer zone"). Note that some forms of violence are overwhelmingly likely to occur within the home itself - most notably, domestic violence.

While the fourth issue lies outside of the limits of the current study's focus on burglary, each of the first three international findings is clearly evident in the Danish data. Figure 1.1 shows the percent of trips to Danish residential burglaries occurring at various distances from offenders' homes. While the trip distances identified in these data actually range from 0 to 279 km, Figure 1.1 is restricted to crime trips of 25 km or less - which includes 87% of all trips in the dataset. The distance to burglary among this Danish sample is short: the most common trip is approximately 0.5 km, and 50% of all trips are less than 4.7 km. The frequency of burglary decreases rapidly with distance from the offender's home (distance decay); and there is clear evidence of a "buffer zone" within which offenders avoid committing burglary.[1]

[1] Trip distances in Figure 1.1 are measured in Euclidian distance ("as the bird flies") and rounded to the nearest 0.5km unit. The first bar – which indicates 6.3% of trips at "0km" – includes trips ranging from 0 to 0.2499 km (since all values between 0 and 0.2499 round to 0 km). Meanwhile, the second bar – which indicates 9.7% of trips at "0.5 km" - includes trips ranging from 0.25 to 0.7499 km (since all of these values round to 0.5 km), etc. Alternative methods of rounding were considered, but each has its own particular drawbacks. For instance, rounding up to the next highest 0.5 km unit would eliminate the 0km category and, with it, all evidence for the presence of a buffer zone. This report only rounds distances when used in connection with distance distribution figures, and never in connection with other forms of tabulated statistics.

Figure 1.1. Danish Journey to Residential Burglary (n=3,238 trips by convicted offenders)



Source: POLMAP 2002/3

Target Selection Criteria

Paulsen and Robinson (131, 2004) describe three factors that behavioral geographers have identified as crucially important to offender decisions about where to commit crime: target backcloth, spatial attractiveness, and target attractiveness (Paulsen and Robinson, 131, 2004):

- *Target backcloth* refers to the spatial distribution of the specific types of victims that an offender favors. Trip distances for offenders who favor burglary of summer houses will, for example, be dictated by the need to travel to the areas in which summer houses are found

- *Spatial attractiveness* refers to the extent to which offenders feel comfortable in a given area. For example, offenders do not want to stick out, so they will often shun areas where their physical appearance is likely to identify them as an "outsider."[2] Spatial attractiveness also reflects the ease with which an area can be accessed. All else being equal, areas closer to the offender's home will be chosen over those further away.

- *Target attractiveness* refers to an offender's perceptions concerning the availability and quality of potential targets in a given area. Considerations of target attractiveness would lead most burglars to seek out wealthy areas (high value targets) characterized by single family houses (easy to enter; high value goods inside).

All else being equal, target attractiveness would suggest that public beliefs concerning a tendency for burglars to seek out wealthy suburbs to commit crime might well be correct. Yet not all else *is* equal. Furthermore, spatial attractiveness would suggest quite the opposite, especially when one considers that the majority of burglars do not live in the wealthy suburbs in question.

[2] Indeed, American research indicates that, like most crime, burglary in the USA is largely an intra-racial affair, with relatively few white offenders burgling non-white neighborhoods, and vice versa.

Awareness Space

Brantingham and Brantigham's (1981) article, "Notes on the geography of crime," is one of the most cited theoretical statements on the journey to crime, and lays out a series of testable hypotheses concerning the way in which offenders identify and select areas in which to commit crime. Awareness is primary in this decision-making process, since offenders can only consider areas they know to exist. These areas of "cognitive awareness" tend to cluster around offender "anchor points," including homes, workplaces, and places of leisure, as well as along the pathways connecting these "nodes" of social activity. The fact that most people are best familiar with their own home areas goes a long ways toward explaining the fact that crime journeys are so short. Note, however, that research by Rengert and Wasilchick (1985) indicates that workplaces provide the second most important node of orientation – at least among those offenders who were working during the previous six months. For those who were unemployed, places of leisure fill the gap. Interestingly, the trips depicted in Figure 1.1 above have a mean distance of 14.0 km – not completely different from the mean distances Danes travel to work and leisure activities (Table 1.1).[3]

Table 1.1. Mean Distances Danes Travel between Home and Various Activities, National Data 1996-2001

Type of Journey	1996	1997	1998	1999	2000	2001
Home to work	14.8	15.9	14.4	14.4	15.2	15.0
Home to leisure	15.3	16.3	15.3	16.3	17.6	17.8
Home to shopping	5.9	6.5	6.5	7.0	7.3	7.1
Home to other	11.0	11.3	11.3	11.1	12.0	12.1

SOURCE: Statistics Denmark's StatBank, Table TERM11: Average journey lengths and traveling time by purpose by distance of journey and type.

Correlates of Awareness Space and Distance Traveled

Since awareness space is likely to differ by various characteristics of the offender, trip distances should be affected. Brantingham and Brantingham (1981) make the following hypotheses regarding the relationship between offender characteristics, awareness space, and travel distance:

- Age:
  - Hypothesis: Persons old enough to get around on their own, but young enough not to be homebound by marriage or children are the most mobile in general. This group should therefore tend to have a greater awareness space, and thus the longest trip distances (B&B, 1981, 36).
  - Evidence: The evidence here is mixed. A number of studies have found a negative correlation between age and distance traveled (i.e., as age goes up, distance goes down, and vice versa), though some (but not all) of the most cited studies in this regard included children as young as 10 (Baldwin and Bottoms, 1976) and 11 (Phillips, 1980). The fact that 10-years-olds do not

[3] Means are presented in Table 1.1 only because data on median distances were unavailable. Given the significant effect that extreme cases can have on the travel distance means, this report generally relies on median, as opposed to mean, distance information.

drive cars and may not even be used to riding public transport on their own would seem to disqualify them as a reasonable group from which to make generalizations about the relationship between age and distance traveled. Furthermore, it is interesting that most (if not all?) of the prior research has sought evidence of a linear relationship between age and distance traveled (e.g., correlation) when Brantingham and Brantingham's (1981) hypothesis actually predicts a curvilinear, inverted U-shaped, relationship.

- Gender:
  - Hypothesis: Since they are more often tied to the home, women will have a more limited awareness space than men (B&B, 1981, 36).
  - Evidence: Most studies find that females travel shorter distances to their crimes than males (Paulsen and Robinson, 2004).

- Prior Criminal History:
  - Hypothesis: Offenders are likely to actively expand their areas of awareness as time progresses and they become better at learning to spot the "cues" of attractive targets that they pass on the fringes of their routine paths and nodes of travel. Therefore, prior criminal history should be positively associated with increased awareness space and increasingly longer crime trips (B&B, 1981, 45).
  - Evidence: A number of studies indicate that distance traveled increases with number of prior crimes. For example, in a recent study of serial burglars in New South Wales, Australia, Meany (2004) found that mean trip distance increased from 10.7 km for the first offense to 14.8 km for the last.

- Co-Offenders:
  - Hypothesis: While the Brantingham's do not mention co-offending specifically, they do state that offenders who discuss crime experiences with other offenders should develop a wider area of awareness though information sharing. It therefore seems likely crimes characterized by co-offending – which are presumably oriented by the areas of awareness of all parties involved – would involve longer trip distances than crimes committed by lone offenders.
  - Evidence: The author is not familiar with any research on this question.

- Urbanicity:
  - Hypothesis: Awareness spaces are centered around the home, work, school, and places of leisure, as well as the routine paths that connect these nodes of activity. Since these nodes of activity tend to be closer to each other in densely populated urban locations, areas of awareness should be smaller and crime trips shorter (B&B, 1981, 37). Furthermore, target backcloth – or the distribution of attractive opportunities – is likely to be far more compact in urban than rural locations, once again suggesting that crime trips in urban locations should be shorter.
  - Evidence: Trips made by offenders living in urban locations are indeed shorter than those made by offenders in rural locations (Barker, 2000). This may well

reflect differences in cognitive maps, though target backcloth would suggest the inevitability of this finding.

The relationship between each of the offender/offence characteristics described above and the journey to Danish burglary is examined in Section 4 of this report.

Two General Caveats Regarding Journey to Crime Research

Two caveats should be kept in mind when considering the results of journey to crime research:

1) Generalizability: Since the measure of trip distance requires address data on both victims and offenders, journey to crime research is limited to samples of crimes committed by apprehended offenders. Strictly speaking, the results of the current study are therefore only generalizable to burglars caught by police. Since less than 9% of burglaries result in clearance by citation, younger, less professional, and/or unluckier burglars may be overrepresented in the study's results. Furthermore, *if* local burglars are more likely to be identified and cited than out-of-towners, this could result in an underestimation of average trip distance.[4] These threats to validity are common to all official record-based journey to crime studies, and can only be avoided by undertaking far more costly, ethnographic investigations (which, of course, suffer their own sample selection biases, plus numerous other methodological issues). Note, however, that Wiles & Costello (2002) have argued that official record samples based on cited offenders should be relatively representative of the most *active* offenders - since almost all of these high-rate offenders get caught in the long run.

2) Origins/Anchor Points of the Journey to Crime: Journey to crime research measures the distance between an offender's residence and his or her crime, thereby implying that offenders' homes are the origins, or anchor points, from which these journeys begin. This, of course, needn't be the case, since crime trips may begin from work, from school, from the home of friends or family, or from vacation locations in another part of the country. It is, in fact, quite possible that some of the long distance crime trips (e.g., over 200 km) included in the Danish data examined in this report are the work of bored Copenhagen youngsters on holiday with their parents in Jutland (a possibility explored in the pages to come). Given this caveat, some researchers prefer to avoid the phrase "journey to crime" altogether, and instead use "offender residence-to-crime distances" (e.g., Rossmo et al., 2004). Nonetheless, the current report retains the catchphrase "journey to crime" despite its technical inaccuracy.

A Road Map

This report proceeds as follows:
Section 2 introduces the Danish data and describes the methodologies applied.
Section 3 compares and contrasts the distributions of crime trips by type of property.
Section 4 examines the correlates of crime trips in bivariate and multivariate contexts.
Section 5 considers the extent to which burglars seek out high-income areas to victimize.

[4] On the other hand, it is not impossible that "strangers" may stick out and therefore be at heightened risk arrest – which would make for longer trip measurements and cancel out the alternative bias

Section 2: Data and Methodology

This section of the report describes the sources of the data examined, the units of analysis and sample selection criteria applied, and the method by which distance is measured. It also provides descriptive statistics on the primary variables examined.

Data

The data used in this report were obtained from two sources:

1. The POLMAP database, which is derived from POLSAS (*politiet sagsstyringssystem*), an integrated "case steering system" now operational in all 54 Danish police districts.[5] POLMAP data are of exceptionally high quality, and represent one of the few centralized national databases on police-registered crime found anywhere in the world. While the vast majority of prior studies have examined journeys to crime within specific police beats, neighborhoods, or cities, POLMAP data allow for the examination of crime trips on a nationwide basis. These data are therefore a rather unique source of information and aptly suited for the current analyses.[6]

2. Statistics Denmark, which provided information on housing density and mean gross household income at the postcode level per January 1, 2003.[7]

Units of Analysis and Sample Selection Criteria

This study examines:

- 3,238 crime trips
- each of which resulted in formal charges levied against an individual age 15 or older
- for burglary or attempted burglary
- committed during the period 1 January 2002 to 31 August 2003
- at six types of residential property
    - stand-alone houses (villas)
    - apartments
    - farm houses
    - free time houses, including both summer cottages and colony houses
    - garages and sheds (primarily associated with stand-alone houses)
    - cellars and lofts (primarily associated with apartments)

[5] The POLMAP data are identical to those available in POLSAS, except that POLMAP adds geographic coordinates on offender and victim residences and crime locations so that these data can be examined using GIS software. The current study uses the geographic coordinates to measure Euclidian ("as the bird flies") distance, but conducts all analysis using a non-GIS statistical analysis program (SAS, v.8.02).

[6] I gratefully acknowledge the assistance of Detective Chief Inspector Ole L. Jacobsen of the GIS Office, National Center of Investigative Support, National Commissioner's Office. Ole extracted the POLMAP data used in this report for me, and has given many hours of his time to explain its content.

[7] These data are available in hardcopy from Statistics Denmark in their 2004 publication, *Nøgletal på Postnumre* (Key Numbers by Postcode).

- where registered address data for both the convicted offender and the victim household meet the highest standards of validity and specificity (i.e., Address Quality Rating=100%).

Measuring Distance

This study measures the Euclidian distance between geo-coded address coordinates for burglars and their victims. Euclidian distance is a straight line ("as the bird flies") and is easily calculated on the bases of Pythagoras' theorem:

$$\text{Distance} = \sqrt{(X_{\text{target}} - X_{\text{home}})^2 + (Y_{\text{target}} - Y_{\text{home}})^2}$$

Descriptive Statistics

Table 2.1 provides descriptive statistics on the sample beginning with the dichotomous variables. In terms of **type of property**, the sample is dominated by crime trips to stand-alone houses (61.7%) and free-time houses (17.6%), which collectively comprise 79.3% of the crime trips analyzed. Only 11.8% of the sampled crime trips were **attempts** at burglary. This low proportion of attempts is partially attributable to the fact that attempts are both less likely than completed crimes to be reported to police, and less likely to be cleared by arrest if reported. **Female offenders** contributed only 3.1% of the crime trips analyzed, and non-Danish citizens contributed only 5.5%. Classification as "non-Danish" refers to citizenship at the time of arrest. Just over half (53.7%) of the crime trips sampled were **cross postcode trips**[8] – which means that analyses concerning the effects of differences in offender/victim postcode characteristics (e.g., average income) will be limited to this group of 1,705 crime trips.[9]

The list of continuous variables begins with **distance traveled (km)**, which has a mean of 14.0, but a median of only 4.7 – the combination of which indicates extreme skew due to a few very big distances, the maximum of which was nearly 279 km. **Offender age** ranged from 15-67 with a median age of 22. Co-offending was common. There was a mean of 1.8 **offenders per burglary**.[10] Serial offending was also common. When averaged across all crime trips, offenders had a mean of 13.6 **convictions for burglary in 2002/3** (i.e., during the 20-months study period), though this mean is inflated by a handful of extremely active offenders; the median was four convictions.[11] There are slightly fewer **dwellings/km2** in the areas where victims live (median=75.2/km2) as compared to those areas where offenders live

[8] Statistics Denmark provides information for 591 postcodes. Information on postcodes from Copenhagen C, Vesterbro, and Frederiksberg C are provided in aggregates of 100. For example, postcode information from Copenhagen C is provided in 5 groups: that for postcodes 1000-1099, 1100-1199, 1200-1299, 1300-1399, and 1400-1499. Likewise, information for Vesterbro is aggregated into three groups comprising the postcodes 1500-1599, 1600-1699, and 1700-1799. Frederiksberg info is aggregated in two groups for postcodes ranging from 1800-1899 and 1900-1999. Danish postcodes vary in size from 0.3 to 450 km2, with a mean and median size of 73.2 and 48.4 km2, respectively. The offenders in this study come from postcodes with a mean and median size of 129.3 and 83.6km2, respectively.

[9] This is because there is no variation within postcodes. Put another way, if an offender and a victim live in the same postcode, then average income in the victim's postcode cannot be used to explain his/her assailant's travel pattern.

[10] 25% of the burglaries and 43.7% of the crime trip units involved more than one offender (data not shown).

[11] These numbers include convictions for crime trips excluded from the current sample due to sub-standard address quality.

(median=88.7/km2), though both are more densely built up than the national average.[12] A measure of mean gross household **income in (Dkr. 1000s)** is available for victim and offender postcodes. Not surprisingly, the mean and median are slightly higher in victim as compared to offender postcodes. But the difference is very modest, and neither differs considerably from the national average for all 591 postcodes.[13]

Table 2.1. Descriptive Statistics Based on 3,238 Total Crime Trips

	n	%	Median	Mean	Std	Min	Max
DICHTOMOUS VARIABLES							
Type of Property							
Stand-alone houses (villas)	1,998	61.7%	-	-	-	0	1
Apartments	279	8.6%	-	-	-	0	1
Farms	159	4.9%	-	-	-	0	1
Free time Houses	571	17.6%	-	-	-	0	1
Garages/Sheds	134	4.1%	-	-	-	0	1
Cellars/Lofts	97	3.0%	-	-	-	0	1
Attempt (no entry or loss)	381	11.8%	-	-	-	0	1
Female Offender	99	3.1%	-	-	-	0	1
Non-Danish Citizen	178	5.5%	-	-	-	0	1
Cross Postcode Crime Trips	1,705	53.7%	-	-	-	0	1
CONTINUOUS VARIABLES (n=3,238)							
Distance Traveled (km)			4.7	14.0	28.8	0.0	278.9
Offender Age (years)			22	24.6	7.8	15	67
Number of Offenders per Burglary			2	1.8	1.1	1	7
Convictions for Burglary in 2002/3			4	13.6	22.6	1	101
Dwellings/km2: Victim Postcode			75.2	477.6	1182.4	4.1	18104.3
Dwellings/km2: Offender Postcode			88.7	642.2	1467.6	4.9	18104.3
Income (Dkr. 1000s) : Victim Postcode*			375	390.2	76.3	244	886
Income (Dkr. 1000s) : Offender Postcode*			366	371.8	55.1	244	696
Climbing (Dkr. 1000s)			0	18.4	74.4	-314	571
Climbing in Cross Postcode Trips (n=1,705)			15	34.9	99.6	-314	571

*Mean gross household income.

Economic "**Climbing**" (i.e., economic mobility), which also measured in Dkr. 1000s, represents the difference between the mean gross household income in the postcodes associated with individual pairs of victims and offenders (i.e., victim postcode income minus offender postcode income). "Climbing" is a positive number when the victim's postcode is characterized by a higher income than that of the offender. Among the 3,238 crime trips examined, there was an median "climbing" value of 0, though the mean was 18.4 due to some exceptionally large values (e.g., maximum value of 571 – which indicates that a certain victim's postcode in this extreme specific case had a mean gross household income that was 571,000 Dkr. greater than the mean in the postcode in which the offender in that case lived). Recall, however, that just under half (46.3%) of the total 3,238 crime trips units of analysis

[12] The median and median for all 591 postcodes are 28.7 and 262.0, respectively, with a minimum of 3.3 (postcode 6857 in Blåvand) and a maximum of 18,122.2 (the aggregated postcode "1700" in Vesterbro).
[13] When all 591 postcodes are considered, the median/means for mean gross household income are 391,000 and 402,000, respectively with a range that runs between 243,000 and 886,000 (all in DKr.).

were within-postcode trips – in which case "Climbing" will equal zero by definition (since the income values it is based on are identical for both victim and offender). **Climbing in Cross-Postcode Trips** shows that when analysis is restricted to offenders that crossed a postcode boundary, the median "climb" is 15,000 DKr., and the mean "climb" is up to nearly 35,000 DKr. These data cannot be used on their own to infer that burglars have a tendency to seek out victims in wealthier areas, though they will be used to address this question later in Section 5.

Details on Sample Selection

Additional details regarding the units of analysis and sample selection criteria used in this report are provided below for those interested.

Crime trip units of analysis

The units of analysis examined in this study are "crime trips." Since some crimes involve more than one offender (co-offenses) and some offenders commit more than one crime (serial offenders), there are more crime trip units of analysis than either crimes or burglars. The 3,238 "crime trips" analyzed in this study were made by 1,379 different burglars convicted in connection with 2,444 distinct crimes (burglaries). Table 2.2 provides a detailed look at the overlap between crimes per burglar, burglars per crime, and crime trip units of analysis.

Table 2.2. Crime Trip Units of Analysis as a Function of Crimes per Burglar and Burglars per Crime

A. Crimes per Burglar (n=1,379 Burglars)			B. Burglars per crime (n=2,444 crimes)						Row totals and %	
			1	2	3	4	5	6	2444	
			1835	485	80	34	3	7		
			75.1%	19.8%	3.3%	1.4%	0.1%	0.3%	100.0%	
N of Crimes	N of burglars	% of burglars	C. Crime Trips Units of Analysis (n=3,238 crime-trips)						Row totals and %	
1	898	65.1%	514	254	93	29	8	0	898	27.7%
2	201	14.6%	252	108	35	5	2	0	402	12.4%
3	108	7.8%	215	98	7	3	1	0	324	10.0%
4	52	3.8%	142	58	8	0	0	0	208	6.4%
5	22	1.6%	68	36	5	1	0	0	110	3.4%
6 to 92	98	7.1%	644	416	92	98	4	42	1296	40.0%
Total	1379	100.0%	1835	970	240	136	15	42	3238	100.0%
%	100%		56.7%	30.0%	7.4%	4.2%	0.5%	1.3%	100%	

Source: POLSAS

Note that only 514 (15.9%) of the crime trips analyzed were fully independent of all other crime trips in the dataset (i.e., only 514 of the crime trips analyzed involved a lone offender who committed just one burglary). This enormous degree of non-independence is partially attributable to the fact that investigations focused on apprehended suspects very often turn up evidence of additional crimes and accomplices. Yet it undoubtedly also reflects the

widespread degree of serial and co-offending known to occur in connection with crime in general (Wolfgang et al., 1972; Reiss, 1988, 120-122).[14]

Formal charges against an individual age 15 or older
This study only includes information on burglars ages 15 or older who were formally charged (*sigtet*) with a burglary offense. The analysis is restricted to charged individuals in order to eliminate inclusion of "the usual suspects" - local bad guys whom the police may routinely consider as suspects, but for whom no charges or formal evidence ultimately arise.

Burglary and attempted burglary
This study includes attempted burglaries. 381 (11.8%) of the dataset's 3,238 crime trip units of analysis resulted in no entry or property loss to the victim.[15] Attempted burglaries were included in the sample since this will allow comparison of crime trip distance for completed versus attempted crimes.

Period 1 January 2002 to 31 August 2003
These dates were selected on practical grounds. January 1, 2002, was the day that the POLSAS datasets became officially and fully operational in all 54 Danish police districts. August 31, 2003 was the last day for which full data were available for use in the current analysis.[16]

Six types of residential property
POLSAS classifications for type of property are determined by the attending officer either with or without input from residents. Distinctions between property types are taken relatively seriously since the five-digit crime code (*gerningskode*) used to distinguish different forms of burglary is recorded on the basis of property type.

- Stand-alone houses (*villas*) – shortened to "Houses" in this report - are used to describe single-family houses, excluding farmhouses, but including row- and linked-houses. Two-family houses, such as those found in some parts of Frederiksberg, are borderline cases in which the attending officer determines property type on the basis of his or her own judgment and/or the judgment of residents. Typically, however, a residence will be classified as a stand-alone house if it has one or, at most, two residences inside it, and has the outward appearance of a single-family structure.

[14] Since Table 2.2 portrays the overlap of units of analysis *used in this report*, it only reflects crime trips characterized by very high quality address data. The offenders captured in this study were actually convicted for more serial and co-offending (i.e., more crime trips) than that shown in Table 2.2 – in fact, as many as 102 crimes per burglar and seven burglars per crime. These actual convictions are reflected in the variables "Convictions for Burglary n 2002/3" and "Offenders per Burglary" described in connection with Table 2.1 earlier in this section.
[15] 284 (11.6%) of the 2,444 crimes were categorized as attempts.
[16] Since 20 months worth of data were examined, there is an over-representation of cases from the months January through August as compared to cases from September through December. This raises a methodological issue, since burglary rates are higher than average in late November and particularly elevated during the last two weeks of December (Sorensen, 2004, 14). Despite this, the use of the 20-month dataset is not expected to bias the results of the current study, since the focus here is on distance traveled to burglary as opposed to the volume of burglary. It is also important to note that a sub-analysis indicated no significant difference in crime trip distance by month or season when all property types were considered simultaneously.

Designation as a stand-alone house implies that the burglary occurred in the residential interior of the dwelling, as opposed to in an associated garage or outdoor shed.

- Apartments (*lejligheder*) are multi-family dwellings, typically stacked on top of one another. Designation as an apartment implies that the burglary occurred in the residential interior of the dwelling, as opposed to in an associated cellar or loft storage room.
- Farmhouses (*landejendomme*) are stand-alone residences distinguished by their active use (and official tax status as used) in connection with farming. Designation as a farm house implies that the burglary occurred in the residential interior of the dwelling.
- Free time houses include both summer cottages (*fritidshuse*) and colony garden houses (*koloni have*). The fact that these rather heterogeneous forms of property are combined arises from their aggregation in POLSAS statistics, as opposed to a purposeful decision on the part of this author. They are likely to exhibit rather different burglary patterns, since summer cottages are typically bigger, comprised of more valuable belongings, and better secured than colony garden houses. Indeed, summer cottages in many ways resemble stand-alone houses (*villas*) more than they do colony garden houses. This said, these forms of property do share the relevant qualities of both being unoccupied for large portions of the year, as well as a tendency to lie in sparsely populated areas. Designation as a free time house implies that the burglary occurred in the residential interior of the dwelling.
- Garages and sheds (*garager/udhuse*), shortened to "garages" through much of this report, are generally associated with stand-alone houses, but can also be connected to farms and the summer cottages comprising free time houses. These garages and sheds may or may not be physically connected to their associated properties.
- Cellars and lofts (*kældre/lofter/pulterrum*), shortened to "cellars" through much of this report, are typically associated with apartment buildings, almost all of which in Denmark provide storage facilities for residents in cellars and/or lofts above and/or below the residential quarters of the building. These facilities are generally not very well secured.[17]

Registered address data meet the highest standards of validity and specificity
Address data and personal identification numbers obtained by police for both victims and offenders are entered into POLMAP and then cross-validated using the National Address Registry – which should include an up-to-date address for every person living in Denmark. Since the National Address Registry is used in connection with all kinds of official correspondence – including that related to welfare payments, housing subsidies, medical treatment, and nearly all other social services – it is likely to be relatively up-to-date - even for the unemployed, the drug addicted, and others living on the fringes of conventional society. The National Address Registry indicates whether a specific address exists and who

[17] The inclusion of free time houses, garages/sheds and cellars/lofts differs from previous reports by this author (on repeat victimization and temporal patterns) where these forms of property were excluded. In the past, these exclusions were justified on methodological grounds, since these forms of property often lack uniform address designations (which hampers calculation of repeat rates), and can go unvisited for weeks or months at a time (which hampers calculation of temporal patterns). They are included in the current study because (a) there are no significant reasons to exclude them, (b) they represent significant numbers of burglaries, and (c) their associated crime trip patterns provide an interesting contrast to those found in connection with burglaries in houses, farmhouses, free time houses, and apartments.

lives there. The availability of this registry for address cross-validation is an important methodological advantage to having conducted this journey to crime study in Denmark.

Once address data have been validated against the National Address Registry, POLMAP assigns an Address Quality Rating code to the address that can range from 10 to 100. This code indicates the specificity of the geo-code (i.e., the x y coordinate) assigned to the address on a GIS system. The lowest Address Quality Rating score is 10, which indicates that the address has merely been geo-coded at the center of the police district in which it lies. The highest Address Quality Rating score is 100, which indicates that the x y coordinate assigned to the address is essentially "right over the chimney." Given the importance of accurate address coordinates in the present study, crime trips were only included when addresses for both the burglar's residence and the burgled household were given quality ratings of 100. This level of quality is certainly higher than that necessary for an overall analysis of the journey to crime, but means that distances registered for even short trips (e.g., 100 meters) can be considered quite accurate.

Sample Crime Trips as a Fraction of All Reported Burglaries

There were 80,529 residential burglaries reported at the six types of properties examined in this report during the 20-month period January 1, 2002 to August 31, 2003. Of these cases, 5,588 (6.9%) resulted in the apprehension and formal charging of 2,530 burglars who collectively accounted for 6,415 crime trips. Address data for both these offenders and their victims were checked against the National Address Registry and assigned geo-coordinates specifying their locations of occurrence. Based upon the specificity of the geo-coding process, 3,238 of these crime trips (50.5% of the collective crime trips resulting in formal charges) were given Address Quality Ratings of 100%. These 3,238 crime trips are the units of analysis used in this report. They are associated with 2,444 separate burglaries, 3.0% of all reported burglaries during the 20-month study period.

Section 3: Crime Trip Distributions

Figures 3.1a to 3.1c illustrate the Danish journey to residential burglary at all properties at three levels of detail by focusing upon increasingly narrower segments of the distribution.

Figure 3.1a. Full Distribution: Trips from 0 to 279km. Depicts 100% of the 3,238 Trips

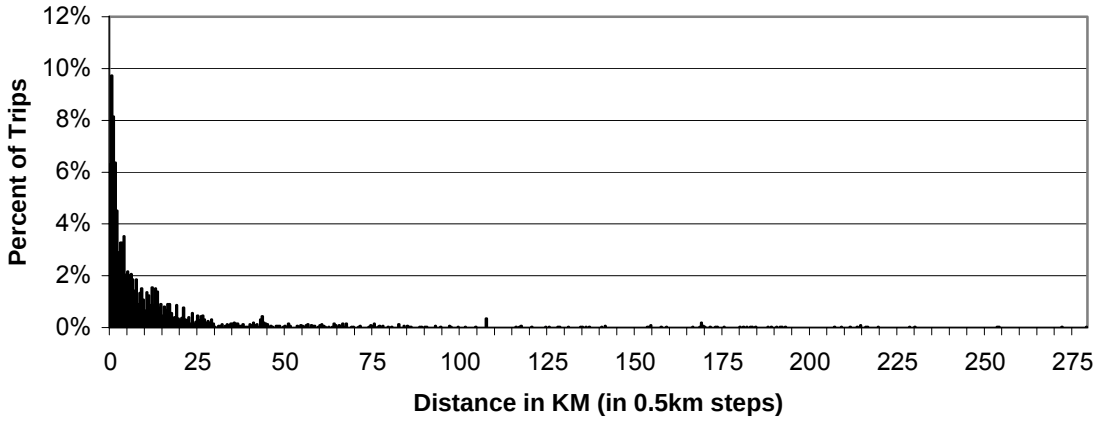


Figure 3.1b. Trips from 0 to 50km: Depicts 94.1% of the 3,238 Trips

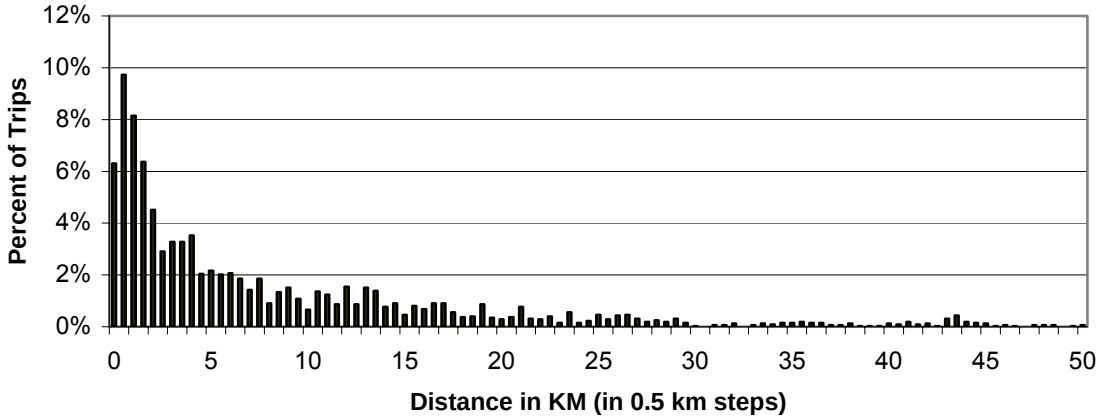


Figure 3.1c. Trips from 0 to 25km: Depicts 87.6% of the 3,238 Trips

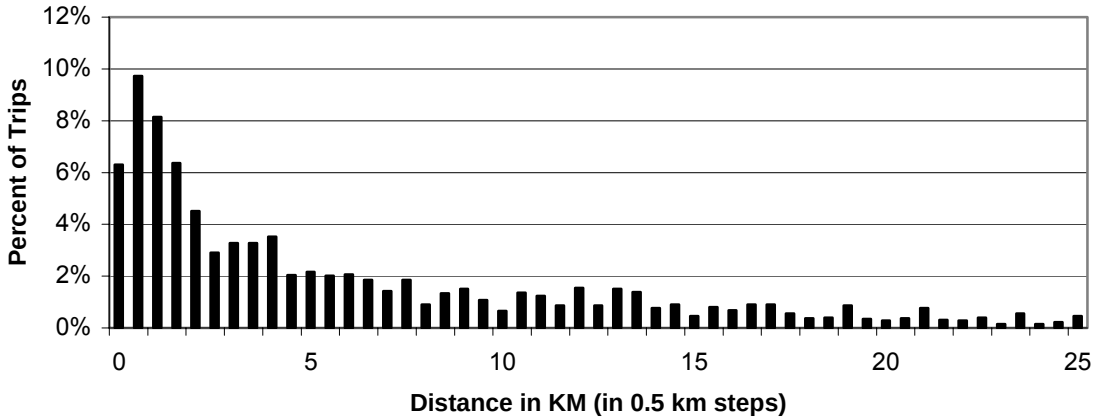


Figure 3.1a, which portrays the full distribution of trips – 0 to 278.9 km – indicates just how skewed the overall distribution is. It is, in fact, so skewed that it makes little sense to portray the full distribution, since doing so provides almost no visual information of any interest on the right side of the figure, and leaves the left side too small to assess. Figure 3.1b is therefore used to portray the same data through only the first 50 kilometers – which still shows the vast majority (94.1%) of the total 3,238 crime trips.[18] Contrary to the situation in Figure 3.1a, the buffer zone surrounding offenders' residences now becomes visible. Yet even this attenuated figure provides very little information of any real interest on its right side. Therefore, Figure 3.1c is used to portray the same data through only the first 25 kilometers. This view, which still shows 87.6% of the data, seems to provide the best balance of detail and breadth, and is therefore used throughout the remainder of this section. As discussed in Section 1, the basic distribution of Danish crime trips conforms to that found in all major international studies: a large proportion of trips are relatively short; there is a buffer zone surrounding offender residences; and the frequency of trips declines with distance from offenders' homes.

However, this author knows of no published research that has investigated the extent to which these trademark patterns generalize across burglaries at different forms of property. Interestingly, the data discussed next suggest they do not.

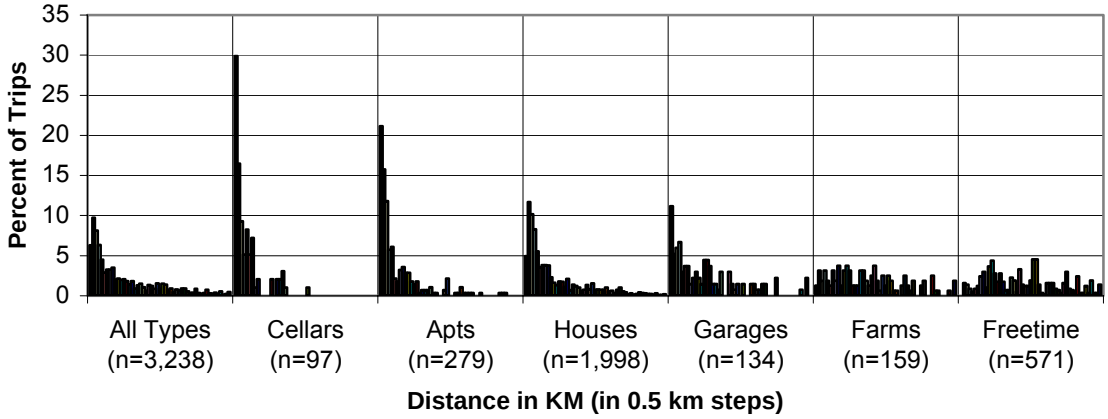
Comparative Crime Trips: The Median is Not the Message

Figure 3.2 below provides the same data for journeys to all property types once again, but this time also portrays property-specific distributions – ordered by median trip length - for comparative purposes.

While details are hard to make out in this figure, it is clear that crime trip patterns differ significantly by type of target. The distribution for (stand-alone) houses (i.e., *villas*) comes closest to that for all types combined, which reflects the fact that the 1,998 trips to houses account for 61.7% of all crime trips examined. Unlike the distribution of trips to houses, the distribution of trips to garages, apartments, and cellars exhibit no "buffer zones" whatsoever when viewed in 0.5 km steps – an interesting finding given the extent to which buffer zones are described in the journey to crime literature as something of a criminological constant. Meanwhile, crime trips to free time houses and farms fail to exhibit the stark distance decay pattern so evident in the distribution of crime trips to other types of property. The difference between these various distributions is further clarified by the descriptive statistics provided in Table 3.1. In short, the "average crime trip distribution" is at best an imperfect reflection of crime trips to houses, and largely misrepresents patterns associated with trips to all other forms of residential property. The remainder of this section examines crime trips to each form of property individually and considers both substantive and methodological reasons for the patterns observed.

[18] To be clear, this figure is based on data from all n=3,238 crime trips, but it only depicts data from 94.1% of these trips since the remaining 5.9% are above the 25 km line and not shown in the figure.

*Figure 3.2. Comparative Crime Trip Distributions, by Type of Property**



* Figure illustrates only the first 25km of each distribution.

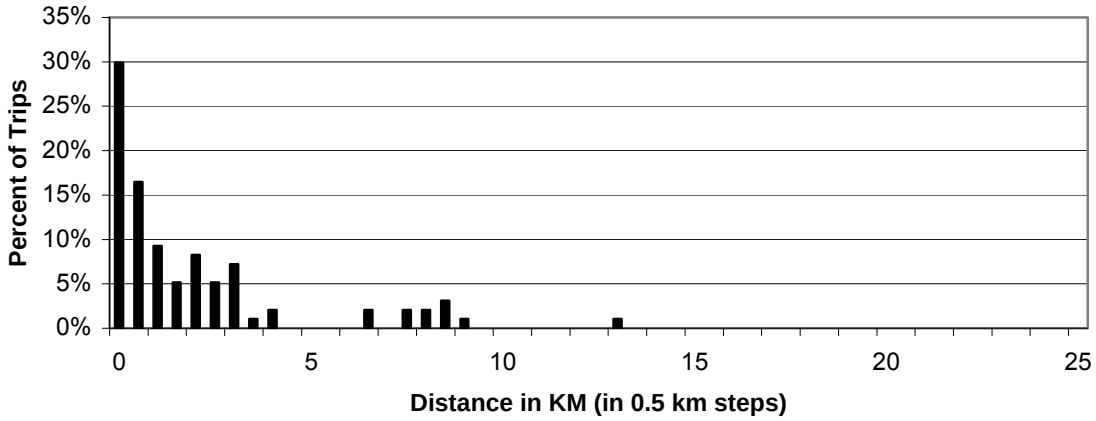
Table 3.1. Comparative Crime Trips Distribution Statistics, by Type of Property

Type of Property	n	Min	P5	P10	P25	**Median**	P75	P90	P95	Max	Mean	StD
All Types	3,238	0.0	0.2	0.4	1.3	**4.7**	13.5	29.4	58.5	279.0	14.0	28.8
Cellars/lofts	97	0.0	0.0	0.0	0.1	**1.0**	2.8	8.0	13.2	125.5	4.9	16.6
Apartments	279	0.0	0.0	0.0	0.3	**1.3**	4.9	14.5	46.0	183.2	7.5	21.1
Houses	1,998	0.0	0.3	0.5	1.1	**3.5**	11.3	28.9	64.3	271.9	13.4	30.8
Garages/sheds	134	0.0	0.2	0.2	1.5	**5.8**	11.8	24.7	38.4	104.3	10.7	17.1
Farms	159	0.0	1.0	1.8	5.2	**10.6**	20.8	80.3	116.0	191.9	23.7	38.5
Freetime houses	571	0.3	2.6	3.9	6.4	**13.3**	23.4	36.8	44.2	279.0	18.8	23.5

Trips to cellars and lofts

The shortest crime trips in these data are those to cellars and lofts (hereafter "cellars"), where half of all trips are under 1 km. The brevity of these trips presumably reflects the architectural tendency for cellars to be located within apartment buildings in densely populated, urban locations. Indeed, Table 3.2, which provides various statistics on relevant variables by property type, indicates that median postcode housing density (dwellings per km2) is highest at cellar burglary locations. Table 3.2 also indicates that the median age of offenders cited for burglary in cellars/lofts is 28, which is a surprise to this author, who was under the impression that this form of burglary might have been the work of teenage hooligans living in the very same building. While these cellar burglars do, in fact, live within - or very nearby - the buildings containing the storage units they burgle, they are not children, but are, in fact, the oldest group of individuals cited for residential burglary in Denmark. No buffer zone is present at the 0.5km unit level for these cellar/loft crime trip data.

*Figure 3.3. Trips to Burglaries at Cellars and Lofts (n=97)**



* Figure illustrates only the first 25km of the distribution.

Table 3.2. Characteristics of Offenders and Offenses, by Type of Property Burgled

Offender/Offence Characteristic	Cellars n=97	Apts n=279	Houses n=1,998	Garages n=134	Farms n=159	Freetime n=571
Median Distance Traveled (km)	1.0	1.3	3.5	5.8	10.6	13.3
% Attempt (no entry or loss) *	3.1%	10.4%	15.8%	9.0%	4.4%	2.5%
% Female Offender *	3.1%	2.9%	4.0%	1.5%	1.3%	0.9%
% Offenders Non-Danish Citizen *	3.1%	14.7%	6.1%	3.0%	1.3%	1.1%
% Cross Postcode Crime Trips	28.9%	37.3%	49.3%	51.5%	64.8%	72.9%
Median Offender Age (years)	28	25	24	20	26	19
Mean # of Offenders per Burglary	1.6	1.5	1.6	2.1	1.7	2.7
Mean # Burg. Convictions in 2002/3	3.2	4.0	17.3	3.2	7.3	11.5
Median Dwellings/km2: V Postcode	879.3	372.5	95.2	27.6	27.3	24.0
Median Dwellings/km2: Off Postcode	438.7	205.3	101.0	35.7	39.7	36.5
Median Income (1000s): V Postcode*	368.0	356.0	379.0	382.5	385.0	370.0
Median Income (1000s): Off Postcode*	368.0	349.0	364.0	372.5	372.0	370.0
Median Climbing (1000s)	0.0	0.0	0.0	0.0	0.0	0.0
Median Climbing (Cross-Postcode Trips)	39.0	12.0	31.0	16.0	14.0	-1.0

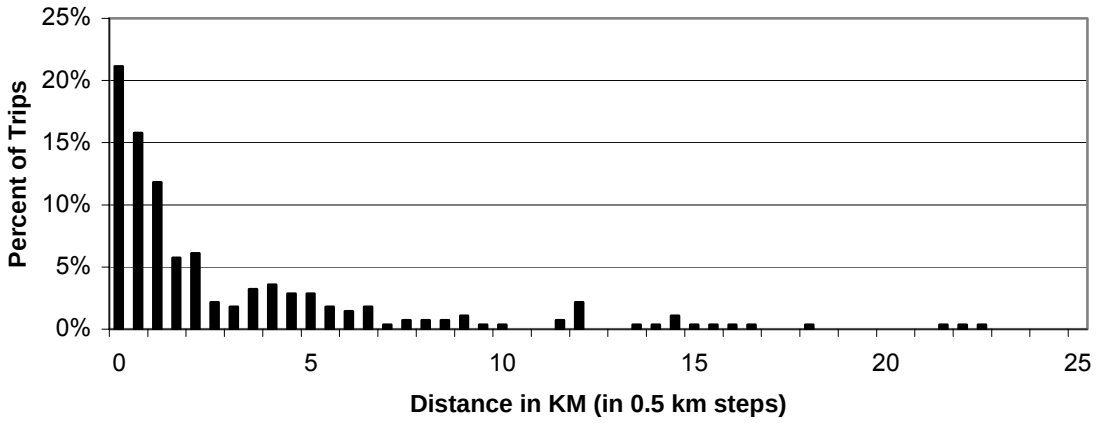
* Extreme caution should be used when interpreting the three variables marked with stars (*) due to small sample size – especially in connection with burglaries at cellars, garages, farms, and – to a lesser extent – apartments. They should, however, be reasonably reliable in connection with free-time and stand-alone houses.

Trips to apartments

As half of all crime trips to apartments are under 1.3 km, they are only slightly longer than trips made to cellars/lofts. This makes sense since, like cellars/lofts, apartments also tend to be located in urban areas offering rich backcloth opportunities. Interestingly, however, the housing density data in Table 3.2 indicate that areas rich in burgled apartments are not nearly as densely built up as those characterized by cellar/loft burglaries (372 versus 879 dwellings per km2 for apartment versus cellar/loft postcodes, respectively). It therefore seems reasonable to conclude that while most cellars/lofts are surely associated with apartment buildings, not all apartment buildings have cellars and lofts. And those that don't are more

likely to lie outside of urban locations. Apartment burglars have a median age of 25 – three years older than the median age for all burglars (age 22; Section 2, Table 2.1). They are also the most likely to be non-Danish citizens (14.7%, Table 3.2), which presumably reflects the residential density of non-citizens in the urban locations where apartment burglaries are prevalent.[19] Despite the somewhat longer trips involved here as compared to those to cellars/lofts, there is still no evidence of a buffer zone surrounding offenders' homes when viewed on this 0.5 km scale. This fact strikes this author as significant – both because apartments make up a sizable proportion of all burglary reports and because a mistaken, generalized expectation of a buffer zone could lead urban police astray when investigating burglaries at apartments.

*Figure 3.4. Trips to Burglaries at Apartments (n=279)**



* Figure illustrates only the first 25km of the distribution.

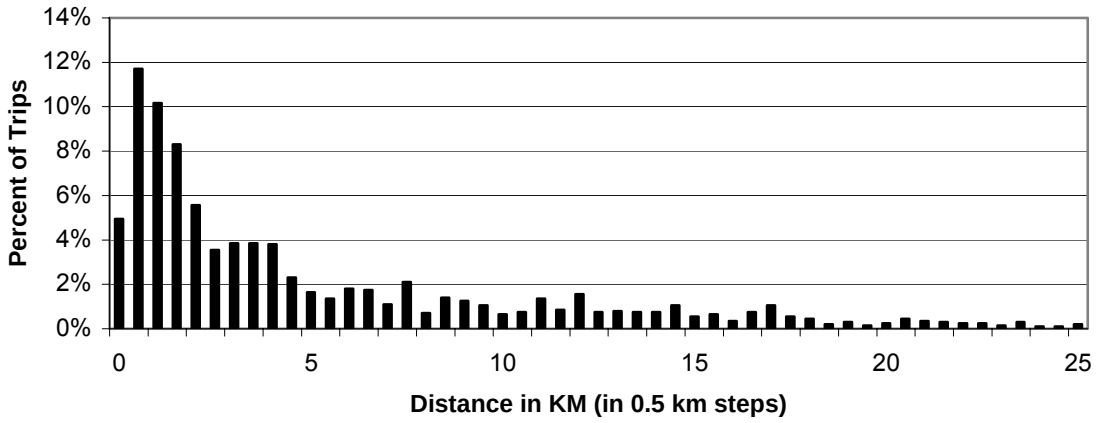
Trips to stand-alone houses

Stand-alone houses ("houses"), which account for more than half of all reported residential burglaries in Denmark, were the targets of just under 62% of the crime trips examined in the current data. Crimes at these properties are therefore largely responsible for the aggregate crime trip distribution. While still relatively short (half under 3.5 km), trips to houses are longer than those to cellars/lofts and apartments due to their more even distribution across both urban and non-urban locations. Indeed, Table 3.2 indicates that the median number of dwellings per km2 in house-burgled postcodes (95.2/km2) is nearly four times lower than that for postcodes associated with burgled apartments (372.5/km2) and over nine times lower than that for those associated with burgled cellars/lofts (879.3/km2). The fact that median trip distances to houses is greater than that for cellars/lofts and apartments is thus clearly related to somewhat poorer target backcloth. When compared to offenders cited in connection with burglaries at all other forms of property, house burglars have a far higher mean number of

[19] All else being equal, this logic would suggest that the proportion of non-Danish burglars should be highest in connection with burglaries at cellars/lofts – since the postcodes characterized by these burglaries are far more densely populated than those associated with burglaries at apartments. Yet not all can be assumed to be equal. Furthermore, at n=97, the sample size for trips to cellars/lofts may be two small to rely upon when dealing with the very small number of non-Danes included in these data.

convictions for burglary (17.3 at any form of property) during the 20-month study.[20] Contrary to the situation with the trips examined previously, the distribution of crime trips to houses is characterized by a clear and significant buffer zone within which offenders appear to refrain from offending. Given the nationwide, large-sample data on which Figure 3.5 is based, it seems safe to hypothesize that the distribution below may be the most reliable portrayal of burglary at a single property category (stand-alone, non-farm, primary residence houses) ever produced in this field of research.

*Figure 3.5. Trips to Burglaries at Stand-alone Houses (n=1,998)**



* Figure illustrates only the first 25km of the distribution.

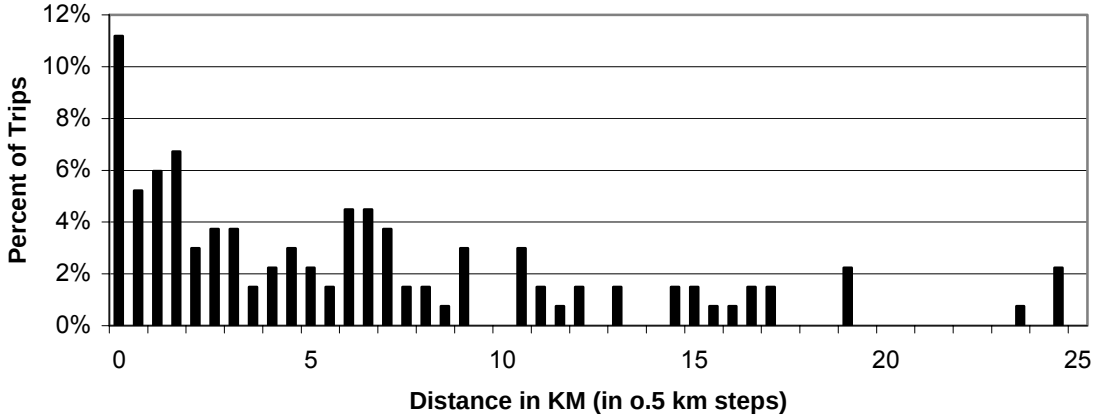
Trips to garages/sheds

Half of the trips to garages were less than 6 km in length. The median housing density of the postcodes where garages were burgled (27.6/km2) is closer to that associated with farms (27.3/km2) and free time houses (24.0/km2) than it is to that of stand-alone houses (95.2/km2). This suggests either that houses with garages are more likely than houses without garages to be located in rural locations, or that a number of the garages burgled are attached to farms and free time houses as opposed to primary stand-alone houses. With a median age of 20 (Table 3.2), the individuals cited with burglary at garages are among the youngest in the sample. Evidence concerning the presence of a buffer zone is mixed. On the one hand, there is clearly no buffer zone indicated in the figure below. Yet when the small sample size is considered in connection with the patterns portrayed, it gives cause to wonder. Could the pattern below reflect the aggregation of burglary data from garages at urban locations (where housing density reduces the likelihood of a buffer) as well as from those in rural locations (where a more protracted buffer is likely)? Or might there be two kinds of offenders at work in these data - (1) those operating very locally without regard for a buffer zone, and (2) those operating less locally and more traditionally in terms of retention of a buffer zone? Interpretations such as these would deserve further exploration if a larger sample of data were shown to validate the distribution observed. All of which suggests an interesting question for future research: Do buffer zone patterns differ systematically by type of offender or property

[20] The median number of prior convictions for house burglars (5) is less than that for free time house burglars (7), but more than that for all other forms of property (2).

location? Given the importance of large sample sizes when disaggregating these data, an issue such as this would be explored in connection with stand-alone houses.

*Figure 3.6. Trips to Burglaries at Garages and Sheds (n=134)**

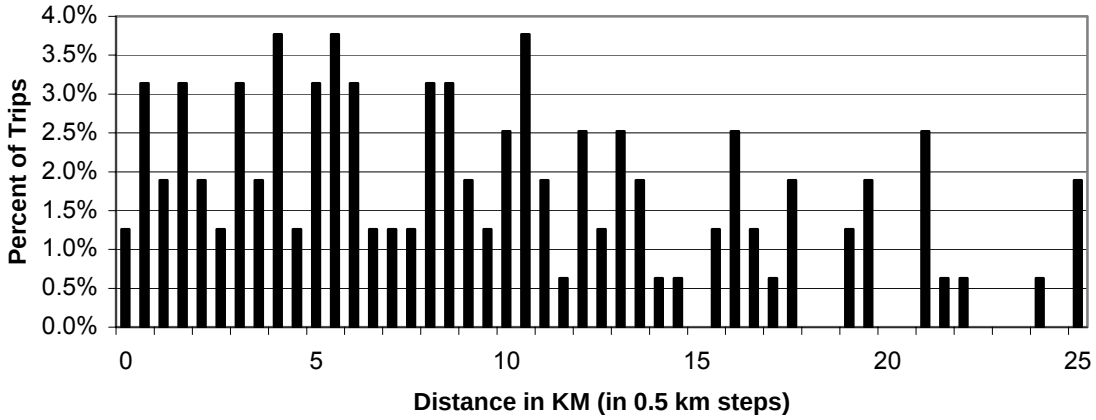


* Figure illustrates only the first 25km of the distribution.

Trips to farm houses

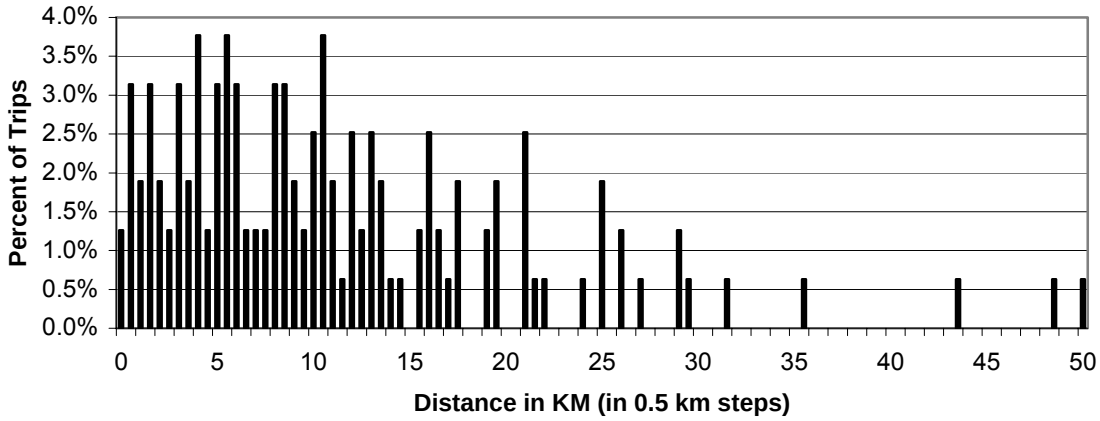
With a median distance of 10.6 km, the average farm-bound crime trip is nearly twice as long as that to garages/sheds – even though the median housing density in postcodes associated with farm and garage/shed burglaries is identical. There is some evidence of a buffer zone in the farm data below, but not of the clear distance decay pattern so visible in all of the distributions examined previously. Given the spread of the data, Figure 3.7 – which portrays the distribution through 25 km – is supplemented by Figure 3.8, which portrays it through 50 km. Distance decay is visible in Figure 3.8, but sporadic – presumably due at least in part to the relatively small sample size (n=159) available for analysis in this crime trip category.

*Figure 3.7. Trips to Burglaries at Farm Houses (n=159)**



* Figure illustrates only the first 25km of the distribution.

*Figure 3.8. Trips to Burglaries at Farmhouses (n=159)**



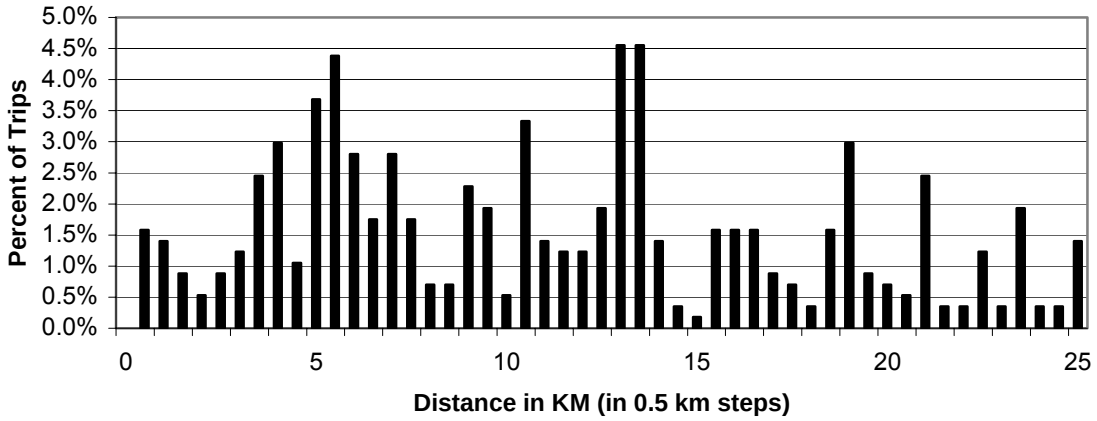
* Figure illustrates the first 50km of the distribution.

Trips to free time houses

With a median distance of 13.3 km, trips to free time houses were the longest of any made in these data. This certainly reflects the fact that free time houses are, almost by definition, located in rural locations – a notion validated by the fact that the housing density is lowest here than for any other crime trip category (24.0/km2; Table 3.2). Note, however, that median offender age is only 19 – the youngest for any property-specific category in the data set. This suggests the possibility that a number of these crimes are committed by bored youth on vacation with their parents. Recall that one of the caveats regarding journey to crime research in general is its assumption that such journeys begin at an offender's home – which is tenuous at best. Trips to free time houses are also characterized by the highest level of co-offending – one significantly higher than that associated with trips to any other form of property. Co-offending is well-known to covary with age (Reiss, 1988), and has a Spearman correlation of Rho= -0.33 ($p<0.0001$; n=3,238) with offender age in the current data. Yet it also stands to reason that crimes involving co-offenders could involve lengthier journeys if a primary offender, who knows an area, recruited secondary offenders, who might live elsewhere, to partake in the local pickings. Likewise, offenders visiting their pals in distant locations might engage in co-offenses, and thus contribute to the proportion of crime trips characterized by long travel distances. Chronic offenders do seem to be over-represented among burglars at free time houses, as evidenced by the fact that mean number of convictions for burglars making trips in this category is 11.5.

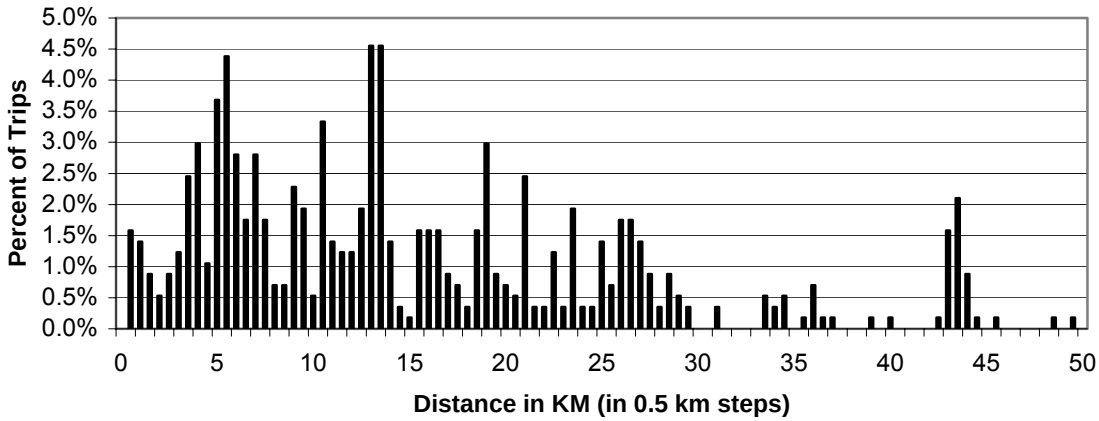
While a somewhat non-typical buffer zone is present in the data below (Figure 3.9), distance decay is not clearly visible in this figure. Since this could be due to extended nature of this category of crime trip coupled with the figure's portrayal of only the first 25 km range, Figure 3.10 is provided to show the free time house crime trip distribution through 50 km. Yet even here, the distribution is rather sporadic – which is somewhat surprising given the relatively large number of cases (n=571) upon which it is based.

*Figure 3.9. Trips to Burglaries at Free Time Houses (n=571)**



* Figure illustrates only the first 25km of the distribution.

*Figure 3.10. Trips to Burglaries at Free Time Houses (n=571)**



* Figure illustrates the first 50km of the distribution.

Summary

Journeys to residential burglary at different forms of property exhibit meaningfully different distributional patterns, a fact that reflects the types of areas in which specific properties lie, the nature of offenders (e.g., age) attracted to different forms of property, and the architectural characteristics of the properties themselves. While the "average crime trip" to burglary best reflects trips to stand-alone houses (due to the prominence of this crime trip category in these data), it provides a completely erroneous picture of the nature of trips to other forms of property and misrepresents even those targeted at stand-alone houses. It is therefore important that any criminal investigative application of the data above be conducted on a property-specific basis.

Section 4. Correlates of Distance Traveled [21]

This section of the report examines the relationship between distance traveled and a handful of relevant characteristics of offenders and offense available within the POLMAP dataset. It begins with bivariate analyses – the results of which are methodologically comparable to similar work done in the past. It then moves on to multivariate analyses, which provide a better indication of the independent effects of each variable.

The Brantingham's Hypotheses

The overall results of this section are considered in light of Brantingham and Brantingham's (1981) hypotheses concerning the relationship between the distance traveled to crime and various characteristics of offenses and offenders. These hypotheses were described in Section 1, but are reviewed here for the purposes of this section.[22]

- *Age Hypothesis*: Persons old enough to get around on their own, but young enough not to be homebound by marriage or children are the most mobile in general. This group should therefore tend to have a greater awareness space, and thus the longest trip distances (B&B, 1981, 36).

- *Gender Hypothesis*: Since they are more often tied to the home, women will have a more limited awareness space than men (B&B, 1981, 36), and therefore more limited crime trip distances.

- *Prior Criminal History Hypothesis*: Offenders are likely to actively expand their areas of awareness as time progresses and they become better at learning to spot the "cues" of attractive targets that they pass on the fringes of their routine paths and nodes of travel. Therefore, prior criminal history should be positively associated with increased awareness space and increasingly longer crime trips (B&B, 1981, 45).

- *Co-Offenders Hypothesis*: While the Brantingham's do not mention co-offending specifically, they do state that offenders who discuss crime experiences with other offenders should develop a wider area of awareness though information sharing. It therefore seems likely crimes characterized by co-offending – which are presumably oriented by the areas of awareness of all parties involved – would involve longer trip distances than crimes committed by lone offenders.

- *Urbanicity Hypothesis*: Awareness spaces are centered around the home, work, school, and places of leisure, as well as the routine paths that connect these nodes of activity. Since these nodes of activity tend to be closer to each other in densely populated urban locations, areas of awareness should be smaller and crime trips shorter (B&B, 1981, 37). Furthermore, target backcloth – or the distribution of attractive opportunities – is likely to be far more compact in urban than rural locations, once again suggesting that crime trips in urban locations should be shorter.

[21] I would like to thank Robert J. Kaminski, University of South Carolina, Columbia, for helpful comments on an earlier draft of this section.

[22] Brantingham and Brantingham (1981) make a number of additional interesting hypotheses not discussed here given the absence of data in POLSAS/POLMAP necessary to evaluate them.

Bivariate Analysis

Table 4.1 provides evidence of the degree of bivariate association and correlation between various characteristics of offenders and offenses and the distance traveled to crime. The association between trip distance and bivariate variables (*Female Offender*; *Non-Danish Offender*) is measured using the Wilcoxon-Mann-Whitney test, while association between trip distance and independent variables with two or more levels (all other variables listed below) is measured using the Kruskal-Wallis test.[23] Both of these tests are non-parametric, meaning that they are applicable to situations where one or more of the variables cannot be considered normally distributed – as is very much the case trip distance.[24] Both tests indicate the likelihood that observed differences in the distances traveled by different groups (i.e., trips associated with different levels of the dependent variable) could have arisen by chance. Results are considered significant (i.e., not due to chance) if their likelihood of occurrence is estimated at less than 1 in 20 (i.e., p-value<0.05). Table 4.1 indicates that, with only one exception (*Non-Danish Citizen*), differences in the distance traveled in connection with various levels of the independent variables examined below cannot be attributed to chance.

Table 4.1. Bivariate Relationship between Theoretically Relevant Offender/Offence Characteristics and Distance Traveled (n=3,238 crime trips)

	Wilcoxon / Kruskal-Wallis Tests				Spearman Correlation	
	Z	χ2	Df	p	Rho	p
Offender Age	-	211.68	42	<0.0001	-0.061	0.0005
Female Offender *	-6.14	-	1	<0.0001	-0.108	<0.0001
Offender Non-Danish Citizen	-1.53	-	1	0.1258	-0.026	0.1258
Convictions in 2002/3	-	413.61	30	<0.0001	0.065	0.0002
Offenders per Burglary	-	97.25	6	<0.0001	0.139	<0.0001
Victim Dwellings/km2	-	1541.83	397	<0.0001	-0.385	<0.0001
Offender Dwellings/km2	-	1358.89	348	<0.0001	-0.288	<0.0001
Victim Postcode Income	-	815.45	179	<0.0001	0.204	<0.0001

* n=3,238 crime trips for all variables except Female Offender, where n=3,231.

The last two columns of Table 4.1 provide Spearman's Rho correlations, which indicate the strength and direction of observed *linear* relationships.[25] While the p-values associated with Spearman's Rho conform perfectly to those derived by the two tests of association (i.e., in terms of what is and is not significant), the strength of Rho is rather weak in all cases.[26] Note, however, that non-linear relationships are not well captured by Spearman's Rho, which may indicate the absence of a (linear) relationship when a (non-linear) relationship, in fact, exists.

[23] The Wilcoxon-Mann-Whitney test is the non-parametric version of the independent samples t-test and can be used when you have a dichotomous independent variable (e.g., *Female Offender*) and prefer to treat the dependent variable (trip distance) as ordinal instead of assuming it to be a normally distributed interval variable. The Kruskal-Wallis test is used when you have an independent variable with two or more levels (e.g., *Offender Age*, etc.) and an ordinal dependent variable (e.g., trip distance).

[24] When examining a large sample such as that used here, the Central Limit Theorem suggests that most parametric statistical techniques will be robust to deviations from normality. The skew in trip distance is, however, so extreme, that the results of parametric analyses are likely to be biased.

[25] Like its parametric counterpart, the Pearson correlation's r, the value of Rho can range from -1.0 (indicating a perfect negative correlation) to +1.0 (indicating a perfect positive correlation). 0.0 indicates no correlation.

[26] A correlation can be highly significant (i.e., clearly not due to chance) but, at the same time, substantively uninteresting (i.e., a Rho value near 0).

This could, for example, well be the case with *Offender Age* – which Brantingham and Brantingham (1981) hypothesized to be curvelinearly related to travel distance. While the correlations obtained below are weak, none of them contradict any of the hypotheses made by the Brantinghams.

Multivariate Analysis

While the bivariate results obtained above are straightforward and instructive, the use of multivariate techniques offers three important benefits.

First off, it allows examination of the effects of each variable *independent* of the effects of all other variables in the model. This is important since some of the variables examined above are inter-correlated. For example, the variable pair *Offender Age* and *Offenders per Burglary* (i.e., co-offending) have a Spearman correlation of Rho= -0.33 ($p<0.0001$, n=3,238), indicating that co-offending decreases with age (as well-know in the literature, e.g., Reiss, 1988). The bivariate association between either one of them and trip distance could, for example, drop out, if the effects of both were controlled for simultaneously within the same model. Likewise, the property-specific difference in average trip length observed in Section III may be fully attributable to the density of housing (i.e., available targets) within an offender's postcode. If so, variables indicative of property type would fail to predict trip distance if *Dwellings per km2 in Offender Postcode* was included in the model.

The second benefit of multivariate analysis is that it offers the possibility to examine the curvilinear effects of variables by including both the variable itself and the square of the variable simultaneously in the model. Given the curvilinear relationship that the Brantinghams have hypothesized to exist between age and trip distance, I include both *Offender Age* and Offender Age Squared, i.e., $(Offender\ Age)^2$, in the multivariate models below.

The third benefit of multivariate modeling is that it can account for the non-independence that exists between the units of analysis examined in this dataset. Recall from Section 2, Table 2.2, that only 514 (15.9%) of the crime trips in this dataset are fully independent of all other crime trips in the dataset (i.e., only 514 of the crime trips analyzed involved a lone offender who committed just one burglary). This lack of independence is inherent to much crime data, and is often ignored - even though it violates one of the underlying assumptions of statistical modeling, namely, that units of analysis are sampled at random and that the selection of one unit has no impact upon the probability of the selection of a second unit. This is decidedly not the case in the present data. This fact presents a statistical problem because data attached to any given crime trip is likely to be correlated with data attached to other trips made by either the same offender or one of his or her co-offenders. While the actual estimates derived for Z and Rho above in Table 4.1 should not be seriously biased by this, their associated p-values (which indicate level of significance) may well be deflated – which would exaggerate their apparent significance.[27]

A caveat

Before presenting the results of the multivariate models below, a single, but important, caveat must be mentioned. The POLSAS/POLMAP data used in this report contain only a handful of

[27] Non-independence, or autocorrelation in statistical parlance, results in an underestimation of the model's standard errors and thus a corollary decrease in p-values (Stokes et al., 2000, 472).

the variables theoretically relevant to trip distance. Many relevant variables are therefore missing, for example, offenders' mode of transportation, modus operandi, and type of goods targeted. This becomes painfully clear when one considers the adjusted R^2 (variance explained) of 0.1924 in Model 1.[28] Technically speaking, the multivariate models shown below are "underspecified" (i.e., do not contain all relevant explanatory variables), which can result in biased parameter estimates if the excluded variables are correlated with both included predictors and the outcome variable of interest.[29] This means that one should not interpret the results below too literally. This said, they still provide a far better indicator of the relationships in question than the bivariate analyses presented in Table 4.1.

Models 1 and 2: OLS and GEE analyses of trips to all types of property

Table 4.2 shows results from three multivariate models. Model 1 is an ordinary least squares (OLS) regression model, while Models 2 and 3 are generalized estimating equations (GEEs). The OLS regression used in Model 1 does not account for the non-independence in the data, but is presented as a familiar benchmark by which to judge the results of Models 2 and 3. The GEEs in Models 2 and 3 account for clustering both within-persons (i.e., serial offending) and within-crimes (i.e., co-offending).[30] While it is possible to look for non-linear relationships between the outcome variable and specific independent variables (as is done below in connection with *Offender Age*), OLS and GEE models are by default designed to assess the *linear* relationship between independent variables and the outcome. They therefore tend to under-estimate non-linear relationships where present.

Both Models 1 and 2 include all of the variables that were included in the bivariate analyses of Table 4.1. In addition, however, they also include five indicator variables indicative of the type of property burgled. Note that there is no indicator variable for stand-alone houses, which serves as the reference category. The effects of each of the property type indicator variables present should be interpreted as compared to the effects of this reference category.[31]

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[28] SAS (ver.8.03) does not provide a corollary to model R^2 at this point in GEE development.

[29] The classic example of under-specification concerns the relationship between storks and fertility – which are strongly associated when examined in a bivariate regression model. The bivariate model described, of course, lacks the theoretically relevant variable, *rurality*, which when added to the model correctly eliminates the apparent relationship between storks and fertility. This is because the initial appearance of a relationship between storks and fertility only existed due to the strong correlation that each of them shares with *rurality*.

[30] All three models include *Number of Convictions in 2002/3* and *Number of Offenders* on theoretical grounds based on the Brantingham's hypotheses. There inclusion, however, is methodologically independent of the means by which GEE adjusts for the autocorrelation caused by serial- and co-offending. This is accomplished by programming statements within the PROC GENMOD program (SAS, ver 8.02) by including the variables *Person ID* (a distinct identification number for each person in the sample) and *Case Number* (a distinct case number for each reported burglary in the sample) in a so-called CLASS statement, and then nesting *Person ID* within *Case Number* in the SUBJECT option of the REPEATED statement (i.e., REPEATED SUBJECT=PersonID(CaseNumber) TYPE= exchangeable). *Person ID* identifies within-person clusters (i.e., serial crimes), while *Case Number* identifies within-crime clusters (i.e., co-offenses). Standard errors, and corollary p-values, are adjusted on this basis. Since a constant level of non-zero correlation is assumed within both persons and crimes, an "exchangeable" correlation structure is specified (See Stokes et al., 2000, 476). GEEs are widely used in bio-medical and epidemiological research, but almost completely ignored within criminology. This is surprising given their utility for dealing with the autocorrelation inherent to both longitudinally- and spatially-clustered data.

[31] All of the variables with a "(0/1)" next to their names are so-called indicator or "dummy" variables which are interpreted as contrasted against an excluded reference category. In the case of the property type indicators, their results should be contrasted against the excluded property type category, stand-alone houses. The effects of *Female Offender* should be interpreted as compared to the effects of being a male offender, while the effects of

The addition of these property indicators is interesting since it demonstrates the residual effects of property type on distance traveled once the effects of all other variables in the model are controlled for.

As should be the case, the parameter estimates produced by the GEE in Model 2 are nearly identical to those produced by the OLS regression in Model 1. The p-values, however, have generally increased, and two variables significant in the OLS context have become non-significant in the GEE context (*Female Offender* and *Non-Danish Offender*). *Convictions in 2002/3* is the only variable that is non-significant in both models.

Table 4.2. Multivariate OLS and GEE Regression Estimates for Theoretically Relevant Variables on ln(Distance Traveled) in km[32]

	MODEL 1 (OLS) All Properties n=3,238			MODEL 2 (GEE) All Properties n=3,238			MODEL 3 (GEE) Houses (Villas) n=1,998		
Intercept	-1.7153	****	<0.0001	-1.5482	**	0.0071	-1.8192	*	0.0101
Apartments (0/1)	-1.1026	****	<0.0001	-1.0427	****	<0.0001	-	-	-
Farm Houses (0/1)	1.0504	****	<0.0001	1.0405	****	<0.0001	-	-	-
Garage/Sheds (0/1)	0.1557		0.3240	0.1095		0.5330	-	-	-
Cellars/Lofts (0/1)	-1.8894	****	<0.0001	-2.0258	****	<0.0001	-	-	-
Free-time Houses (0/1)	1.2942	****	<0.0001	1.2444	****	<0.0001	-	-	-
Offender Age	0.0917	****	<0.0001	0.1169	***	0.0006	0.1335	**	0.0016
(Offender Age)^2	-0.0015	***	0.0002	-0.0019	***	0.0009	-0.0023	**	0.0015
Female Offender (0/1)	-0.5795	**	0.0017	-0.5100		0.0657	-0.7107	*	0.0245
Non-Danish Offender (0/1)	0.3889	**	0.0064	0.2778		0.1192	0.3169		0.1245
Convictions in 2002/3	0.0027		0.0791	0.0007		0.7829	0.0013		0.6389
Number of Offenders	0.0951	**	0.0031	0.1013	*	0.0209	0.1216		0.0636
Dwellings/km2: Offdr. PC	-0.0001	*	0.0170	-0.0001	**	0.0094	-0.0001		0.0053
Income: Victim PC	0.0037	****	<0.0001	0.0026	****	<0.0001	0.0028	****	<0.0001
Adjusted R^2	0.1924			NA[33]			NA		

* p<0.05; ** p<0.01; ***p<0.001; ****p<0.0001

Looking first at the Model 2 GEE estimates for the property indicators, one can see that when compared to stand-alone houses (the excluded reference category), trips to *apartments* and *cellars/lofts* are associated with significantly shorter journeys, while trips to *farm houses* and *free time houses* are associated with significantly longer journeys – this, despite the inclusion

Non-Danish Offender should be interpreted as compared to the effects of being a Danish citizen. Recall that "Non-Danish" here refers to citizenship, and not to ethnicity.

[32] "ln(Distance Traveled)" stands for the natural log of distance traveled. Since all three of the models used to generate results in Table 4.2 were specified for normally distributed data, the natural log of distance traveled, or ln(Distance Traveled), is used as an outcome measure. The log transformation of distance traveled increases the distance between the cases bunched on the left side of the distribution and contracts the distance between those spread out on the right side. This renders the overall distribution far closer to normal, and opens the way for the use of parametric procedures. Use of the natural log is one of the most common approaches to dealing with non-normally distributed data if one wishes to examine them within a parametric statistical context (e.g., Neter et al., 1983, 134-141). The fact that distance traveled is logged in these models needn't concern us, however, since the discussion is limited to the direction and strength of the relationships identified, and no direct interpretation of the parameter estimates is made.

[33] SAS (ver.8.02) does not provide a corollary to model R^2 at this point in GEE development.

of potentially relevant alternative causes, most notably the *Dwellings/km2 in Offender Postcode* (which indicates the density of available opportunities in the offender's home area).

True to Brantingham and Brantingham's (1981) hypothesis, the relationship between *Offender Age* and distance traveled appears curvilinear (as an inverted-U) – rising at first, and then falling, as indicated by the positive parameter estimate for *Offender Age* coupled with the negative estimate for $(Offender\ Age)^2$ - both of which are highly significant (though substantively next to zero). This finding is particularly interesting given the fact that *Number of Offenders* – an indicator of the degree of co-offending – is also positive and highly significant, suggesting that both age and co-offending affect distance traveled *independently of one another*, and do so in precisely the way that the Brantinghams would expect. The continued significance of *Number of Offenders* is no less surprising given the fact that Model 2 accounts for autocorrelation among units of analysis associated though co-offending (i.e., correlated within-crimes). All of this said, the parameter estimates for both sets of variables, but especially *Offender Age* and $(Offender\ Age)^2$, are weak.

Female Offender is no longer significant in the Model 2 GEE, which accounts for sample non-independence. It is, however, not far off (p=0.0657), and its relatively strong, negative correlation with distance traveled is precisely as the Brantinghams hypothesized it should be.

Non-Danish Offender was non-significant in the OLS model (Model 1) and remains non-significant in the GEE model (Model 2). This result is somewhat interesting given rumors of semi-organized gangs of Eastern Europeans who are purported to roam the Danish countryside on criminal rampages. The parameter estimate for Non-Danish Offenders, 0.2778, is in the expected direction (i.e., associated with increased travel), but the p-value, p=0.1192, means that there is an unacceptably high possibility (11.9%) that this result has occurred in these data by chance. The standard interpretation of a result such as this is that there is no compelling (i.e., statistically significant) evidence that Non-Danish citizens convicted for burglary travel any further to commit crime, on average, than convicted Danish burglars.

Convictions in 2002/03 is the only variable that is non-significant in both models. While it was nearly significant (p=0.0791) in Model 1, which did not account for autocorrelation, it does not even approach significance (p=0.7829) in Model 2, which accounts for autocorrelation within both crimes and, importantly here, persons. While this finding does not support the Brantingham's hypothesis regarding prior criminal history, it is by no means a strong contradiction, since the learning process alluded to by the Brantingham's may well be more gradual than anything one should expect to find in only 20-month's worth of data.

The parameter estimate for *Dwellings/km2 in Offender's Postcode* is essentially zero, but nonetheless negative (as predicted by the Brantinghams) and highly significant. Despite its substantive lack of influence on trip distance, it remains an important control variable from a theoretical standpoint, and therefore belongs in the models examined.

The same set of statements can be applied to the results for *Income* (i.e., mean gross household income) *in Victim Postcodes*. The estimate is positive, as predicted by the Brantinghams, and highly significant, but its substantive effect is near zero. Nonetheless, it remains an important control given its theoretical relevance to target attractiveness – which

along with spatial attractiveness and target backcloth are thought to drive offender decision-making processes concerning where to offend (as discussed in Section 1).

Model 3: GEE analysis of trips to stand alone houses
Section 3 indicated enormous variation in the distances traveled and the correlates associated with crime trips to different forms of property. It therefore makes sense to examine whether the relationships observed in Model 2 remain stable when examined solely in connection with crime trips to stand-alone houses (which represent the largest, and thus most stable, crime trip property category). The results are provided in Model 3. In this model, the indicator variables for type of property are removed (since stand alone houses are the only property type examined), and the sample size becomes n=1,998 houses.

Results here are virtually identical to those in Model 2 with two exceptions. First, *Female Offender* crosses back over the line into significance once again (going from p=0.0657 to p=0.0245), and the strength of its parameter estimate increases by nearly 40% (from -0.51 to -0.71). Second, *Number of Offenders*, the indicator of co-offending, drops (just barely) out of significance (going from p=0.0209 to p=0.0636), though its parameter estimate remains stable. While both changes described involve a variable going from significance to non-significance, or vice versa, the actual change in p-value is relatively minor and non-radical.

Summary
The bivariate and multivariate analyses conducted in this section nearly all support Brantingham and Brantingham's (1981) predictions concerning the relationships between various characteristics of offenders and offenses and the distance traveled to residential burglary. The one exception to this was in connection with *Convictions in 2002/3*, an indictor of prior offending, which while significantly associated with distance traveled in the bivariate analysis was unrelated to it in any of the three multivariate models examined. While the results of the multivariate analyses are particularly interesting, and definitely represent an improvement over bivariate investigations, the exact parameter estimates derived should not be interpreted as anything definitive, since numerous variables relevant to trip distance were unavailable for inclusion in these models. Model misspecification due to the absence of theoretically relevant predictors can result in severely biased parameter estimates. Nonetheless, the strength and particularly the direction of parameter estimates remain a good indication of their independent relevance, and have proved interesting in terms of their near unanimous support for the Brantingham's predictions.

Section 5. Do Burglars Systematically Target Affluent Areas?

Rational choice theory (Cornish and Clarke, 1986) takes the neo-Classical position that the decision to commit a specific crime results from a rational calculation of the *perceived* costs and benefits of doing so in a specific context. Overall costs and benefits are thought to reflect a combination of an offender's perceptions concerning three aspects of the contemplated act: risk, effort, and reward. While sociologists of a more positivist persuasion are quick to point out that rationality is "bounded," or limited, by a host of bio-psycho-sociological factors, the idea that some form of (imperfect) rationality drives decision-making is currently very much in fashion (e.g., Cornish and Clarke, 1986; Felson, 1998; Gottfredson and Hirschi, 1990; Wilson and Hernstein, 1985).

This section of the report examines the extent to which burglars travel to wealthy areas in search of lucrative targets. The idea that they might do so implicitly suggests some element of rational decision-making, yet rationality does not necessarily imply that long-trip travel should be attractive to burglars. While the potential for lucrative rewards should serve to increase the rational attraction of travel, the effort it requires should serve to decrease it. Likewise, while the risks of offending too close to home suggest the rationality of some degree of travel, the lack of familiarity with areas outside of a burglar's awareness space argues against extended journeys. A burglar's perceptions of the potential risk, effort, and reward associated with travel are likely to be affected by his or her level of professionalism. And indeed, both research and common sense suggest that "professionals" travel farther than amateurs. But what proportion of burglars can be accurately described as professionals?

Professionalism and Planning

Researchers have long speculated over the level of amateurism versus professionalism among burglars. Weisel's (2002) review of the (primarily Anglo-American) literature concludes that the largest proportion are "amateurs" – a group that compared to "professionals" tends to be younger, less mobile, more easily deterred by dogs, locks and alarms, and less successful in terms of take, resale, and avoiding police. Professionals, she reports, tend to be older, more mobile in their search for targets, less deterred by impediments, and more successful at disposing of property. A chief distinction between amateurs and professionals appears to be the extent to which they have established markets to dispose of their proceeds. While amateurs are forced to seek buyers, professionals tend to have well-established customer networks (Weisel, 2002, 16).

This depiction corresponds relatively well with the description of four prototypical groups of burglars described at the Danish Crime Prevention Council's (2005) website. The first two groups are decidedly amateurish, while the second two are semi-professional and professional, respectively. According to the Council, the largest group of burglars in Denmark is drug addicts, who they estimate are responsible for 75% of all burglaries in the bigger cities. Many of these burglars are in the start of their 20s, tend to travel by foot, and generally go after cash and other light items (jewelry, CDs, video machines) that are both easy to carry and quick to dispose of. In addition to drug addicts, the Council mentions a group of equally non-professional mid-teenaged punks (*lømlen*) who commit burglaries for kicks or to obtain quick cash. Individuals from this group tend to go after cash, liquor, and pc/stereo equipment, all of which they generally keep for their own use.

The third group, which is described by the Council as semi-professional, consists of individuals associated with outlaw motorcycle clubs (e.g., Hells Angels). The fourth group is termed out and out "professionals." While the motorcyclists have some connections to the professionals, the former are described as using rougher, less finessed methods, and as going after items that are easier to sell, but which are generally less valuable. Professionals, on the other hand, are described as planners, who seek high profit and therefore have the luxury of "working" less frequently. They are described as grown men, typically of Danish ethnicity, who have been involved in crime for many years and have an established network of buyers for their stolen proceeds. These professionals favor the use of quick, closed trucks as work vehicles, since they provide a means by which to transport large stolen items such as B&O stereo equipment, expensive furniture, and artwork. Professionals are described as rather selective in their choice of targets, preferring expensive stand-alone houses that they often keep under surveillance and burgle when residents are away. They utilize specific tools for specific jobs, and know how to handle alarm systems. The Council provides no estimates as to the size of this group of professionals or of the semi-professional motorcyclist burglars. However, when added to the group of young "punks," the estimate given in connection with drug addicts indicates that motorcyclists and professionals can only account for a small, though perhaps costly, fraction of all burglaries. It is, however, these individuals that probably make up the majority of the "travelers" identified in the current report. Unfortunately, at this point in its development, the POLSAS/POLMAP datasets do not provide systematic data on modus operandi or goods stolen – information which might otherwise be used to identify professional burglars.[34] This said, if our primary interest is in "volume crime," then we are generally talking about burglaries committed by non-professional as described in connection with the first two groups discussed above.

Mean Gross Household Income as a Measure of Postcode Affluence

This remainder of this section looks at the extent to which burglars appear to seek out wealthy targets. It does this by comparing the *mean gross household income* of the postcodes within which burglars live to the same measure in the postcodes where their victims reside.[35]

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[34] The POLSAS/POLMAP datasets do, in fact, contain three variables related to modus operandi and type of goods stolen. However, these fields are blank in connection with more than 97% of all reported burglaries. The cases for which they are not blank are clustered in specific police districts, and are therefore cannot be generalized to the rest of Denmark. Keep in mind, however, that the POLSAS/POLMAP systems only became fully operational in all 54 Danish police districts on January 1, in 2002. The deficiencies described here are, therefore, likely to be corrected in the near future.

[35] Income data are derived from Statistics Denmark (2004), and reflect conditions on January 1, 2003. This chapter resorts to terminology such as "postcode income," "postcode affluence," and "rich and poor postcodes," etc. – all of which are technically incorrect, but used in an effort to avoid repeated use of the cumbersome phrase, *mean gross household income by postcode*. The use of *mean gross household income* as a measure of postcode affluence has three drawbacks that deserve mention right at the start. First, postcodes with large proportions of families will, all else being equal, have higher mean gross household incomes than those with large proportions of single residents – even if all persons earn the same basic wage (e.g., 1000 households occupied by single residents earning 400,000 Dkr. per year will have a mean gross household income of 400,000 Dkr., while 1000 households occupied by dual-income families where each wage-earner earns 400,000 Dkr. per year will have a mean gross household income of 800,000 Dkr.). This said, it should be noted that areas characterized by double-wage-earning households probably are, in fact, particularly attractive to burglars, since the homes found therein tend to contain more valuable belongings. The second drawback to the use of this measure of postcode affluence concerns its reliance on *mean*, as opposed to *median*, income. This is because mean income is more heavily influenced by extremes of wealth or poverty than median income. A third critique of the measure used has to due with the fact that postcode delineations are no more than artificial boundaries drawn by the postal service without regard for any meaningful social, economic, or cultural differences in

According to data from Statistics Denmark, the postcode in the picturesque island of Sejerø has the lowest household income in Denmark. On the other extreme, Rungsted Kyst's postcode, in northern Sjælland, has the *highest* household income. Statistics on income, population, and number of dwellings are provided in Table 5.1 for the ten "richest" and ten "poorest" postcodes in Denmark.

Table 5.1. Postcodes with the Lowest and Highest Mean Gross Household Income[36]

Ten Lowest Income Postcodes

Post Area and Number		Mean Income*	% Under 200	% 200 to 349	% 350 to 549	% Over 550	Population	Dwellings
Sejerø	4592	243	49.3%	30.2%	14.7%	5.8%	406	225
Copenhagen SV	2450	244	51.0%	28.4%	14.8%	5.8%	15,741	9,593
Odense V	5200	260	49.4%	26.0%	16.6%	7.9%	9,164	4,957
Copenhagen N	2200	275	43.4%	29.8%	17.9%	9.0%	71,215	38,858
Copenhagen NV	2400	277	44.9%	29.4%	15.9%	9.8%	44,370	25,559
Odense Nø	5240	279	43.2%	29.3%	17.8%	9.7%	16,048	6,454
Odense C	5000	286	43.7%	28.9%	16.3%	11.2%	46,239	26,184
Fejø	4944	289	43.3%	29.8%	15.4%	11.6%	637	319
Søby Ærø	5985	293	43.1%	25.0%	21.4%	10.5%	1,065	543
Århus V	8210	294	45.9%	24.5%	15.7%	13.9%	24,503	11,643

Highest Income Postcodes

Post Area and Number		Mean Income*	% Under 200	% 200 to 349	% 350 to 549	% Over 550	Population	Dwellings
Rungsted Kyst	2960	886	8.9%	11.5%	14.8%	64.8%	5,590	2,230
Klampenborg	2930	836	15.6%	15.2%	16.1%	53.1%	4,212	1,771
Skodsborg	2942	755	14.7%	18.7%	20.0%	46.6%	1,725	871
Vedbæk	2950	746	16.2%	15.7%	15.5%	52.6%	7,830	3,075
Holte	2840	696	15.9%	17.0%	16.6%	50.5%	15,074	6,382
Lejre	4320	641	9.8%	13.2%	20.2%	56.8%	2,794	1,019
Hellebæk	3150	617	16.2%	12.2%	20.3%	51.3%	873	345
Charlottelund	2920	599	23.7%	21.2%	18.1%	37.0%	20,652	9,892
Hellerup	2900	591	20.5%	20.3%	18.6%	40.6%	22,519	10,117
Værløse	3500	573	16.3%	18.3%	18.6%	46.8%	18,836	7,703

* Mean gross household income.
Source: Statistics Denmark (2004).

resident populations. Thus, postcodes that contain both wealthy and socially-disadvantaged sections (as is perhaps the case in areas along the coast south of Copenhagen) may wind up appearing as middle-income overall, which misrepresents both the socially disadvantaged and the socially advantaged sub-sections that comprise their collective whole. A better option for the purposes of this section would have been to use data from the Danish Square Grid (Det Danske Kvadratnet), available from Statistics Denmark. These data allow small area differentiation on income and other household characteristics down to the 100 square meter level. These data are, however, too expensive for the types of institutions that concern themselves with serious social problems, and are generally only within the economic reach of organizations promoting the purchase of toothpaste, cosmetics, breakfast cereals, and other consumer products. Note, however, that despite the three critiques outlined above, the full list of postcode incomes (not shown) does appear relatively valid on its face, in that it seems to distinguish what are generally considered "upscale" areas from those generally considered less upscale.

[36] Based on only 591 postcode grouping due to Statistics Denmark's aggregation of street-level postcodes in Copenhagen K, Copenhagen V, and Frederiksberg C. See Section 2 for details.

The full range of postcode income values in Denmark runs from a low of 243,000 to a high of 886,000, and has a median of 390,000 Dkr. Table 5.2 indicates the proportion of burglary victims and offenders (any type property, n=3,238) who fall within low, medium, and high postcode income brackets, where income brackets are based on a trichotomization of the national (non-burglary-related) Danish data on postcode income from Statistics Denmark. Note that more than half of both victims (52.5%) and offenders (64.2%) come from low income postcodes

Table 5.2. Proportion of Offenders, Victims, and All Danes in Each Postcode Income Group

	N	Low	Medium	High
		243-376	377-409	410-886
Victims*	3,238	52.5%	22.9%	24.6%
Offenders*	3,238	64.2%	18.4%	17.3%
Denmark	5,300,000	33.3%	33.3%	33.3%

* At all property types

Table 5.3 shows the same trichotomization for offenders and victims associated with crime trips to stand-alone houses (n=1,998). Patterns here are similar to those for all crime trips, though the proportion of both victims (30.1%) and offenders (19.7%) in high income postcodes is somewhat elevated.

Table 5.3. Proportion of Offenders, Victims, and All Danes in Each Postcode Income Group

	N	Low	Medium	High
		243-376	377-409	410-886
Victims*	1,998	48.5%	21.4%	30.1%
Offenders*	1,998	62.0%	18.4%	19.7%
Denmark	5,300,000	33.3%	33.3%	33.3%

* At stand-alone houses only

Economic Mobility among Burglars

There is also little evidence that trip distance differs systematically on the basis of offender postcode income. Table 5.1 shows median distances traveled to burglary in connection with trips originating in low, medium, and high income postcodes, respectively. While trips originating in low income postcodes appear to be slightly shorter than those beginning in medium and high income postcodes, the difference is not statistically significant.[37]

On the other hand, distance traveled *is* strongly associated with victim postcode income. While median distance among 1,700 crime trips to victims in low income postcodes was 3.5 km, the corollary statistic for the 797 crime trips to victims in high income postcodes was 6.6 km – as shown in Figure 5.2.[38] The more extreme the differences in wealth considered, the greater the difference in trip distance found. For example, while the median distance among 102 crime trips made to the ten poorest postcodes listed above in Table 5.1 was only 1.3 km,

[37] Kruskal-Wallis $\chi 2=0.5687$, 2 df, $p=0.7525$.
[38] Kruskal-Wallis $\chi 2=72.9655$, 2 df, $p<0.0001$.

the 88 crime trips to the ten richest postcodes had a median distance of 14.5 km. Before coming to the conclusion that this reflects a higher concentration of apartments in the poorer postcodes, note that the median trip to burglaries at 74 stand-alone houses in the ten poorest postcodes was even shorter (0.88 km), while the 87 trips to houses in the ten richest postcodes had median distance of 14.6 km.

Figure 5.1. Median Trip Distance (km) by Offender Postcode Income (n=3,,238 Crime Trips)

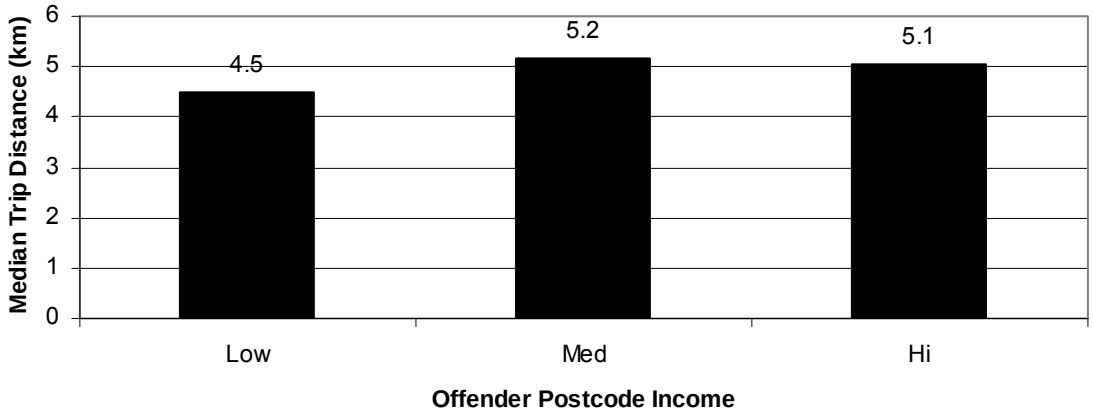
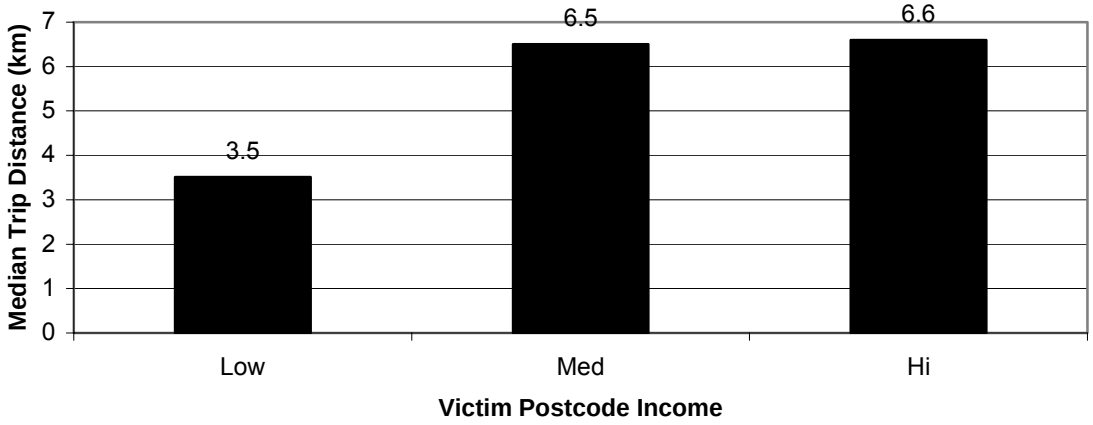


Figure 5.2. Median Trip Distance (km) by Victim Postcode Income (n=3,238 Crime Trips)



At first glance, Figure 5.2 seems to imply a tendency for burglars to make more effort (as indicated by longer trips) to reach dwellings in high, as compared to low, income postcodes. Yet this is merely an illusion. The illusion stems from the fact that burglars seldom live in high income postcodes (e.g., only 17.3% in Table 5.2). Therefore, even if a burglar's trip patterns were completely random, and the affluence of his victims' neighborhoods had absolutely no influence upon his movements, a subsequent tally of his crime trips to rich and poor areas would indicate that he had traveled further to rich areas than to poor ones. But this is simply because the average burglar lives in one of the poorer postcodes, and distance to wealthier postcodes is therefore greater by definition.

The truth is that most burglars stay in their own areas, or areas pretty much like the ones they come from. The descriptive statistics in Section 2 (Table 2.1) indicated that just over half

(53.7%; n=1,705) of the (n=3,238) crime trips examined in this study involved journeys across one or more postcode boundaries. Yet Figure 5.3 below reveals that regardless of burglar home postcode income, over 75% of crime trips end in either the same postcode or one pretty much like it. Burglary, like crime in general, is very much an intra-area affair.

Figure 5.3. Proportion of Crime Trips to Low, Medium, and High Income Victim Postcodes, by Offender Postcode Income (n=3,238 Crime trips)

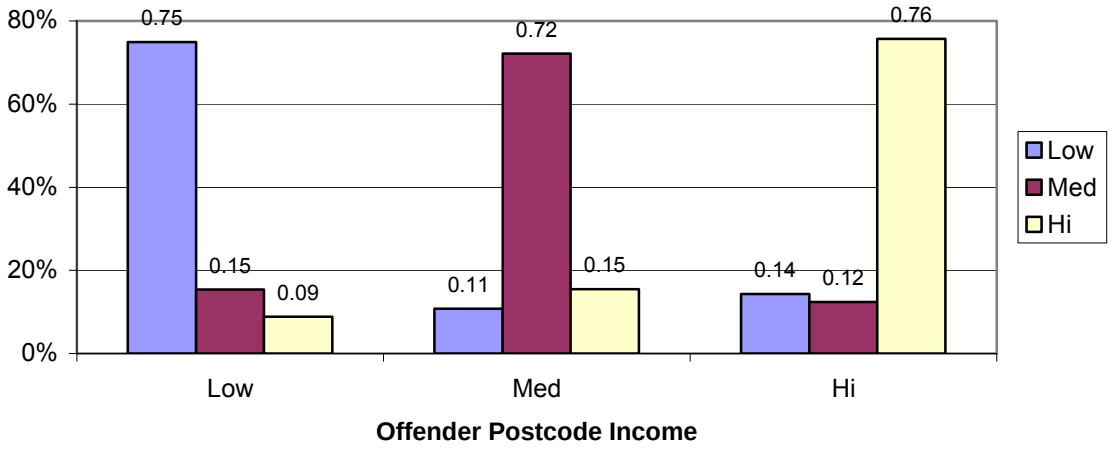
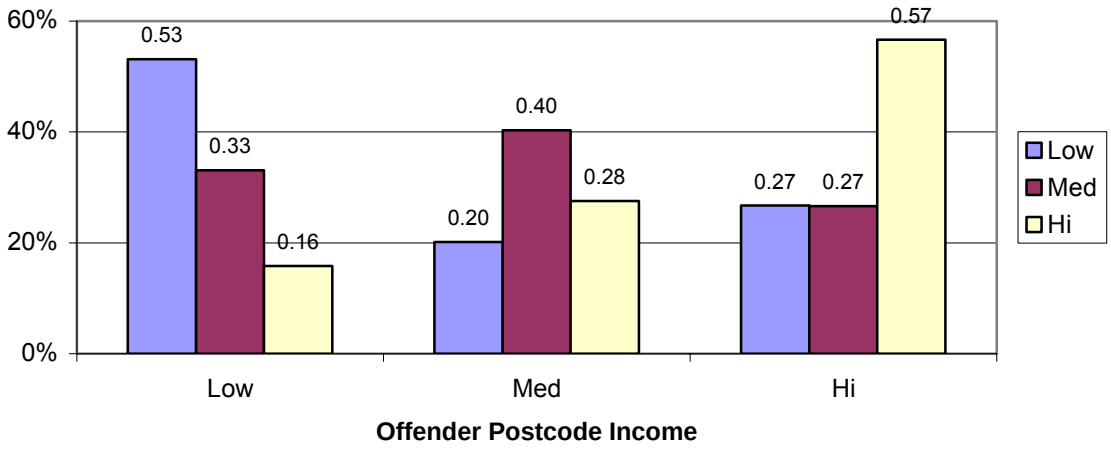


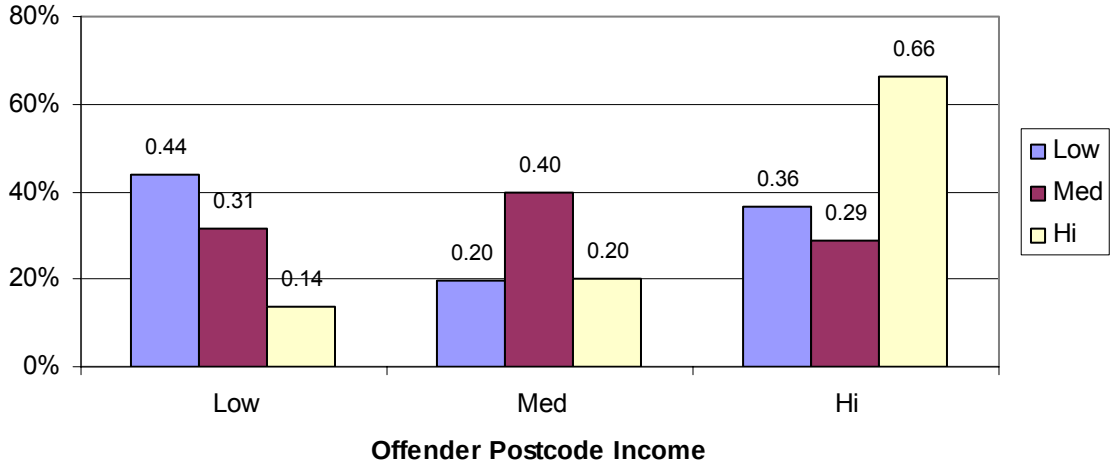
Figure 5.4 clarifies the relationship between offender and victim postcode somewhat further by focusing solely upon crime trips that ended in postcodes other than those in which they began. Thus, even among these 1,705 crime trips that cross postcode boundaries, offenders appear to prefer areas similar to those in which they live. In the minority of cases where burglars from low income postcodes cross into higher income areas, they generally refrained from offending in the top income post brackets. Offenders from high income postcodes appear, on the other hand, to have offended in equal amounts in both medium and low income postcodes.

Figure 5.4. Proportion of Crime Trips to Low, Medium, and High Income Victim Postcodes, by Offender Postcode Income in Inter-Postcode Crime Trips (n=1,705 Crime trips)



Restricting the analysis to crime trips to stand-alone houses has little effect on the overall pattern among those who cross postcode boundaries. While burglars from low income areas are now somewhat more likely to venture into middle income areas, they are still a rare find in high income postcodes. And contrary to what might be expected, burglars from high income areas appear somewhat more likely to enter lesser income areas in search of suitable targets.

Figure 5.5. Proportion of Crime Trips to Stand-alone Houses in Low, Medium, and High Income Victim Postcodes, by Offender Postcode Income in Inter-Postcode Crime Trips (n=985 Crime trips)



The first page of the first section of this report stated four primary objectives, the last of which was "To examine the validity of the popular assumption that burglars favor higher socioeconomic areas when seeking crime targets." While there can be little doubt that some burglars do so, the data presented in this report suggests that these individuals are the exception as opposed to the rule.

Summary

Social psychological research on criminal decision-making currently favors the notion of rational actors. While a desire to increase potential rewards would seem likely to propel burglars to travel, rational concerns for the reduction of both risk and effort argue against this. Prior research in the US and UK describe the majority of burglars as amateurs, a position supported by depictions of Danish burglars provided by the Danish Crime Prevention Council. The data examined in this report indicate that the majority of burglars offend within areas characterized by income levels similar to those in which they live. There is no systematic difference between offenders from different income postcodes in terms of the median distance traveled to burglary.

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