Temporal Patterns of Danish Residential Burglary

By Month, Day of Week, and Hour of Day

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Contents

Summary

This report examines the distribution of residential burglary in Denmark. Specifically, it examines 31,081 completed burglaries (with entry or loss) at villas, apartments and farmhouses reported to police in 2002 by season/month/week of year, day of week, and hour of day.

The report has two purposes: (1) to describe a method for estimating the temporal distribution of crimes - such as burglary and auto theft - that are difficult to pinpoint precisely in time, and (2) to provide an overview of the days and times when reported burglaries occur. The distribution of burglary across time is interesting because it suggests the days and times at which crime prevention efforts should be most effective.

Only 13% of the cases examined in this report involved burglaries where residents could pinpoint the time of occurrence down to a one-hour period. In half of all cases, residents could not even pin it down to an eight-hour period. The current report uses the *weighted estimate approach* to deal with the temporal ambiguity inherent to burglary data. The weighted estimates approach assigns a probability to each hour during which a burglary *might* have occurred based on the number of hours separating the time at which residents last left their homes in tact and the time they returned to find their homes burgled. This procedure results in a smooth curve in which precise temporal estimates are given more weight than imprecise estimates.

Burglars strike less frequently during spring and summer than in fall and winter. This is presumably due to a combination of temperature and hours of daylight since the warmer, lighter seasons are characterized by the informal surveillance of garden users, the difficulty of judging home occupancy on the basis of interior lighting, and the lack of cover of darkness. The peak season for burglary is winter – largely attributable to Christmas. Christmas is not only "the children's party," but also "the burglars' party." The four most active burglary days in 2002 were December 24, 25, 26, and 23, in that order.

Yet these patterns differ somewhat by property type. While burglaries in villas and apartments clearly peak in December, the proportion of burglaries committed against farmhouses does not. The absence of a December peak in farmhouses probably reflects higher rates of occupancy in farmhouses around Christmas.

Burglaries in villas and apartments are most frequent on Fridays and Saturdays. Burglaries in farmhouses follow a completely different rhythm, peaking during the workweek (Mondays - Fridays) and decreasing on Friday nights and throughout the day on Saturday.

The busiest hour of the week for burglaries in villas is 20:00 on Saturday nights. On Mondays through Thursdays, burglaries in villas peak at 11:00 while residents are at work, but also show a distinct, secondary peak at 19:00. These patterns are remarkably stable on weekdays. Patterns on Fridays are mixed – reflecting the fact that the early part of Friday behaves like a workday (small peak at 11:00), while the latter part of Friday behaves like a weekend (big peak 20:00).

Hourly patterns in apartments are similar to those for villas, except that the midday peaks on weekdays tend to come somewhat later in the day – between 12:00 and 14:00 as opposed to 11:00. Burglary patterns in apartments on Fridays are also characterized by both weekday and weekend characteristics, though the midday peak at 14:00 is slightly higher than the evening peak at 20:00. The absolute peak for the week at apartments is Sunday at midnight, which represents a carry-over from the activities of Saturday night.

Farmhouses, on the other hand, suffer a relatively low rate of burglary on Friday and Saturday nights. Like villas, weekday peaks in farmhouses are relatively consistent, all lying at 10:00 or 11:00. The absolute peak for the week at farmhouses is 11:00 on Thusdays.

Examination of hour of day by day of week *and season*, however, suggests that the secondary, evening peaks for burglary on weekdays are only present during the darker months.

Hourly patterns for attempted burglaries differ somewhat from those for completed burglaries. The final figure in the report demonstrates that the inclusion of attempts in the analyses described above would have resulted in averaged distributions that failed to accurately capture either completed or attempted burglaries.

The differences in distributions obtained by type of property, season, and completed versus attempted crimes indicate that the calculation of *average* trends for burglary – or any other crime, for that matter – should be avoided.

Section 1: Introduction

In the United States, the frequency of crime is sometimes presented to the public as a function of time. For example, the Florida Department of Law Enforcement's (2004) "Crime Clock" describes the frequency of reported criminal victimization in the US as follows:

- One violent crime every 4 minutes and 7 seconds
- One property crime every 39 seconds
- One burglary every 3 minutes

While these statistics provide an intuitive "feel" for the frequency with which different crimes occur, they should not be interpreted as suggesting that these crimes are actually distributed evenly across the days, hours, or minutes of any given year. They most certainly are not.

This report examines the distribution of burglary across time in Denmark. Specifically, it examines the distribution of completed burglaries (with entry or loss) reported to police in 2002 by season/month/week of year, day of week, and hour of day. The distribution of burglary across time is interesting because it suggests the days and times at which crime prevention efforts should be most effective.

Crime prevention psychologists argue that the decision to commit a specific crime at a specific location is generally dependent upon an offender's appraisal of target accessibility, suitability, and level of guardianship. In other words, the decision as to *which* house to burgled is likely to reflect a burglar's perception of the ease with which a given home might be entered, the potential contents of that home, and the risk of detection or apprehension (Clarke, 1997, 4). Yet assuming that a burglar has already decided to tackle a given target, the decision as to *when* to burgle that target is primarily a function of perceived risk – itself dependent on the presence or absence of residents and/or other capable guardians.

Burglars clearly work hard to avoid contact with residents. They look for signs of occupancy (noises, lights, cars parked in front) and ring doorbells to confirm their assessments of whether a house is empty. Even occupancy by neighbors can reduce the risk of burglary (Weisel, 2002, 8). Prior to the mass entry of women into the workforce, residential burglary tended to be a nocturnal affair committed while residents were asleep. Yet the proportion of daytime burglaries has risen sharply with the rate of female employment since many more homes are now fully unoccupied during the day (Weisel, 2002, 4). Residences characterized by low occupancy (dual-working couples, single working parents, students) are at particularly high risk (Weisel, 2002, 8).

The temporal distribution of burglary is thus largely driven by residential occupancy patterns. In addition to affecting the risk of being seen, the presence or absence of daylight influences the rhythm of burglary by increasing or decreasing the accuracy with which burglars can judge whether residents are in their homes. In addition to affecting the extent to which doors and windows are shut, seasonal temperatures affect both occupancy patterns and the level of informal surveillance provided by garden

users. All of these factors affect burglary patterns via their influence on burglars' perceptions of risk.

Burglary presents a special problem when it comes to measuring its exact hour of occurrence. This is because the overwhelming majority of burglaries occur when residents are away from the home and therefore cannot be pinpointed precisely in time. Simplistic estimates of the time of occurrence can result in extremely misleading conclusions. The current report uses the *weighted estimates approach* - a relatively simple, yet very effective procedure for overcoming this problem. For some, the discussion of the procedure itself may be as interesting as the results it provides.

This report has two purposes: (1) to describe a method for estimating the temporal distribution of crimes - such as burglary and auto theft - that are difficult to pinpoint precisely in time, and (2) to provide an overview of the days and times when completed burglaries reported in Danish villas, apartments, and farmhouses occur.

Alternatively, one can stop reading now and consider the time clock for reported burglary in Denmark:

- One burglary every 5 minutes.[1]

But this is a gross misrepresentation of the actual temporal distribution of Danish burglary.

[1] Based on 103,215 residential and commercial burglaries (including attempts) registered nationwide in Denmark in 2002 (National Commissioner's Office Website, 2004, Statistics, Police Year Table 2002, Table 4.47).

Section 2: Data

The POLMAP/POLSAS Database

Data for this study are derived from the POLMAP database, which is itself based upon POLSAS, an integrated "case steering system" now operating in all 54 Danish police districts.[2] POLSAS data are of a relatively high quality in terms of validity, and represent what may be the only centralized national database on police-registered crime anywhere in the world. It is, therefore, a rather unique source of information and aptly suited for the current analyses.[3]

While additional data were used to help validate and clean the primary variables,[4] the substantive results of this report are based on only a small subset of the overall data available in POLMAP, including:

- Start Time: Date and time residents report having last left their homes in tact
- End Time: Date and time residents discovered their burglaries
- Type of Property (e.g., villas, apartments, farmhouses)

The Focus on Completed Burglaries in Villas, Apartments, and Farmhouses

POLSAS indicates that there were 52,976 completed or attempted residential burglaries (indbrud i beboelse) in 12 residential categories with Start Times in 2002. A summary of some of the important characteristics of these crimes, by type of property, can be found in the Appendix.

The current report focuses on 31,081 *completed* burglaries (with entry or loss) reported at villas, apartments, and farmhouses in 2002.[5] It excludes all attempts (no entry or loss), as well all burglaries directed solely against any storage units associated with these properties (e.g., cellars/lofts, garages/sheds).

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[2] The POLMAP data are identical to those available in POLSAS, except that POLMAP adds GIS coordinates based on address data so that crime locations can be examined geographically using MAPINFO software.

[3] 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 on 18 September 2003, and has generously given many hours of his time to explain its content. Ole is a clever guy sitting on a mountain of data that should prove extremely useful to day-to-day Danish policing.

[4] Including case number, date and time the burglary was reported to police, and whether the burglary was classified as a completed crime or an attempt (no entry or loss).

[5] In POLSAS, the term "villa" applies to 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 "villa" if it has one or, at most, two residences inside it, and has the outward appearance of a single-family structure. "Apartments" are multi-family dwellings, typically stacked on top of one another. "Farmhouses" refer to stand alone houses actively used in connection with farming.

Why villas, apartments, and farmhouses?
The decision to focus on burglaries in villas, apartments, and farmhouses reflects the fact that burglary patterns differ significantly within these three categories, and far more when other categories are considered. Examining aggregated temporal patterns across all forms of property results in a meaningless average distribution unreflective of any one of them. Examining temporal patterns for more than three forms of property requires far more tables than any reader would want to consider. Villas, apartments and farmhouses collectively comprise over 98% of all occupied, full-year dwellings in Denmark,[6] and collectively suffered 70% of all residential burglaries reported in 2002 (and 99% of those reported at full-year residences).

Why exclude storage units?
Crimes committed solely against storage units (e.g., cellars/lofts; garages/sheds) are excluded for two reasons. First, the reporting rate for completed crimes in storage units is undoubtedly far lower than that for residences. Second, since some residents visit their cellars or lofts relatively infrequently, it is particularly difficult to pinpoint when these crimes occurred. This is reflected by the fact that the mean time elapsing between Start and End Dates/times at storage units is nearly 4 ½ times longer than that for burglaries directed against residential interiors (see Appendix).

Why exclude attempts?
According to the International Crime Victims Survey (ICVS), 88% of completed burglaries experienced by Danish respondents in 1999 were reported to police.[7] The corresponding figure for attempts was 25% (Kesteren et al., 2000, 194). Given the relatively high rate of reporting for completed burglaries, analyses based on police reports for completed burglaries are likely to be reasonably representative of *all completed burglaries* in Denmark (whether reported or unreported). This, however, cannot be said for attempts.

While the totality of exclusions described above limits the forms of burglary examined in this report, it maximizes the validity of the patterns presented for the specific forms of burglary examined. This seems a reasonable trade-off, especially when one considers that the public's fear of burglary is primarily generated by violations of the inner sanctum of the home.

Descriptive Statistics
The sample of burglaries examined in this report is shown in Table 2.1. This sample includes all completed burglaries reported at villas, apartments and farmhouses with Start Dates in 2002.[8]

[6] The remainder being rooms, including those used in connection with residential communities for youth and the elderly, and college dormitories (Statistics Denmark, StatBank, Table BOL1). Rooms are excluded from the current analysis because of their relatively low frequency of burglary (n=496 in 2002), which precludes the possibility of detailed, disaggregated analysis.

[7] The ICVS questionnaire on burglary specifically excludes thefts from "garages, sheds and lockups" as well as those from "second houses," but includes thefts from cellars (Kersteren et al., 2000, 138).

Table 2.1: Completed Burglaries in Villas, Apartments, and Farmhouses, 2002

Type of Property	N	%
Villas	23,295	75.0%
Apartments	5,697	18.3%
Farmhouses	2,089	6.7%
ALL TYPES	31,081	100.0%

Table 2.2 provides a first look at the temporal imprecision inherent to burglary data. On average (ALL TYPES), only 13.2% of burgled residents were able to estimate the time of their burglary's occurrence down to a one-hour time window. Over 50% could not even place it within an eight-hour window. The fact that not even half of these crimes were discovered within eight hours reflects the fact that many burglaries occur while residents are at work. Three-quarters of all burglaries were discovered within 16 hours, and 85% within 48 hours. Speed of discovery differs somewhat by property type, though these differences change over time. For example, while apartment dwellers were quickest to discover their burglaries in the initial hours (14.5% within one hour), they were also the group with the highest proportion of residents who failed to discover their burglaries within 48 hours (17.9%).

Table 2.2: Time to Discovery: Proportion of Cases by Number of Hours Separating Start and End Periods (in %)

Property	N	<=1	<=2	<=3	<=4	<=5	<=6	<=7	<=8	<=9	<=10	<=16	<=24	<=48	>48
Villas	23,295	13.2	16.7	21.0	26.0	31.6	37.7	44.0	50.3	56.3	56.0	69.7	77.1	86.1	13.9
Apartments	5,697	14.5	19.3	23.7	28.5	33.3	37.5	41.8	46.7	51.6	56.0	66.7	73.5	82.1	17.9
Farmhouses	2,089	10.1	13.8	21.6	26.4	30.9	36.8	42.8	42.8	49.7	54.9	66.7	75.9	83.4	16.6
ALL TYPES	31,081	13.2	17.0	21.3	26.1	31.5	37.2	43.1	49.2	55.0	59.3	69.0	76.3	85.2	14.8

Additional descriptive statistics are provided in Table 2.3. The means shown, however, are heavily influenced by the relatively small proportion of residents that failed to notice burglaries in their homes for a very long time – such as those on vacation or extended travel abroad. Indeed, residents of one farmhouse failed to notice that they had been burgled for 13,066 hours, or 544 days!

[8] End Dates are allowed to lapse into 2003, which means that the study captures one full year of data. Note, however, that this sampling criterion differs somewhat from standard police procedure, which distinguishes crimes "committed" in one year as opposed to another on the basis of when they were *reported* to police. Apart from its use for validating and cleaning the data, this study entirely ignores the date that burglaries were reported to police. This is because the combination of Start and End Dates provides a far more reliable indication of when they actually occurred.

Table 2.3: Mean, Minimum and Maximum Number of Hours Separating Start and End Times

Type of Property	Number of Cases	Mean Hours	Standard Deviation	Minimum Hours	Maximum Hours
Villas	23,295	39.1	313.0	0	12,192
Apartments	5,697	51.2	309.2	0	8,784
Farmhouses	2,089	67.9	500.5	0	13,066
ALL TYPES	31,081	43.2	328.4	0	13,066

Before leaving this section, one final fact deserves mentioning. The original sample included 31,082 cases. A single case (in an apartment) had to be dropped from the data set because its recorded End Time was 8 ½ hours *earlier* than its recorded Start Time. The fact that this occurred in only one case out of 31,082 is a testimony to the quality of the POLSAS/POLMAP database.

Section 3: Measuring Time of Occurrence Using Weighted Estimates

The Temporal Imprecision of Burglary Data

The time to discovery data shown in Table 2.2 of Section 2 provide an initial indication of the challenge that burglary presents for temporal analysis. If a New Year's Eve reveler leaves home at 20:00 on Tuesday December 31 and returns home to find himself burgled at 2:30 on January 1, how might one specify the hour, day, or even year during which this crime occurred?

The Weighted Estimates Approach

The current report uses the *weighted estimate approach*, as described by Gottlieb et al. (1994) and the Home Office Crime Reduction Website (2004).[9] The weighted estimates approach assigns a probability to each hour during which the burglary *might* have occurred based on the number of hours separating the Start and End Periods. The probabilities assigned for all cases at all hours are ultimately summed. The result of this procedure is a smooth curve in which Start/End Periods characterized by a short time window are given more weight than those based on a longer time window.

Consider the ten hypothetical cases in Table 3.1, which we will assume for simplicity's sake all occurred on the same day. Probabilities are assigned to each one-hour window during which these burglaries might have occurred. Since Case 1 spanned 13 separate one-hour periods (including the period 20:00-20:59), the probability that it occurred during any one of these periods is 1/13, or 0.0769. Likewise, the probability that Case 2 occurred during any one of the nine one-hour periods separating 8:15 and 16:48 is 1/9, or 0.1111. The only case where hour of occurrence is totally straightforward is Case 7, which occurred during the one-hour period 11:00-11:59. The probability that Case 7 occurred during this period is therefore 1/1, or 1. Cases are counted as having possibly occurred *during* a particular one-hour period if the End Time extends one minute (e.g., 12:01) or more into that period. [10]

[9] Crime Reduction Toolkits, Focus Areas and Hotspots, Time of Day. Available on-line at: www.crime-reduction.gov.uk/toolkits/fa020404.htm

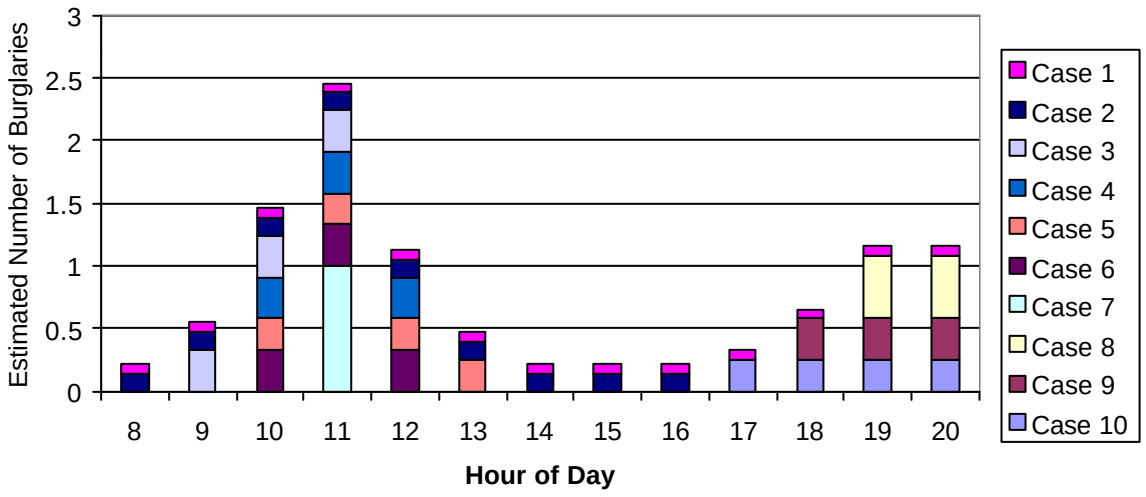
[10] The author has decided where to draw the line as to how far a time window should extend into the next hour in order to be counted as having possibly occurred *during* that hour. Burglaries with End Times precisely on the hour are excluded because a lot of people, when asked when they returned home and discovered a burglary, reply "around 17:00" (or "around 1:00", or "around 23:00"). Therefore, there are many cases with End (and Start) Times that fall right on the hour. Yet when somebody says they came home "around 17:00," the implication is that the burglary occurred *prior* to this time. If, on the other hand, someone reports coming home at "17:10" or "17:05" or "17:02" it implies that the crime might have occurred during the very beginning of Hour 17. While it certainly seems unlikely that a burglary could have occurred between 17:00 and 17:02, it is not impossible. And once one begins hypothesizing as to what is and is not possible, it leads down a slippery path (17:10? 17:15?). Therefore, End Times falling at least one minute into a one-hour period are counted as having possibly occurred during that period.

Table 3.1: Hourly Probabilities Attached to Ten Hypothetical Cases with Varying Start End Times

Case	Start	End	Window	8	9	10	11	12	13	14	15	16	17	18	19	20
1	08:00	20:22	13	1/13	1/13	1/13	1/13	1/13	1/13	1/13	1/13	1/13	1/13	1/13	1/13	1/13
2	08:15	16:48	9	1/9	1/9	1/9	1/9	1/9	1/9	1/9	1/9	1/9				
3	09:00	11:15	3		1/3	1/3	1/3									
4	10:00	12:01	3			1/3	1/3	1/3								
5	10:46	13:53	4			1/4	1/4	1/4	1/4							
6	10:42	12:30	3			1/3	1/3	1/3								
7	11:00	11:15	1				1/1									
8	19:10	20:30	2												1/2	1/2
9	18:22	20:05	3											1/3	1/3	1/3
10	17:00	20:15	4										1/4	1/4	1/4	1/4

The probabilities above are summed and charted in Figure 3.1, which provides the best estimate of when the crimes in question occurred. In these fictitious – but reality-based – data, burglary peaks while residents are away at work, and then shows a distinct secondary peak while residents are out for the evening or working second shift. Note that cases characterized by relatively precise temporal data (e.g., narrow time windows) contribute more to the distribution than cases characterized by imprecise temporal data. Thus, while all cases are retained for analysis, the weight attached to any given case is automatically adjusted on the basis of the temporal precision of the raw data. The retention of all cases is important, since cases that contribute little to the distribution of burglary by hour of day may still contribute to the distribution of burglary by day of week or season of year. Indeed, since we have assumed that all of the cases in Table 3.1/Figure 3.1 occurred on the same day, the probability that they occurred on that particular day is 1/1, or 1.

Figure 3.1: Distribution of Ten Hypothetical Cases Using the Weighted Estimates Approach



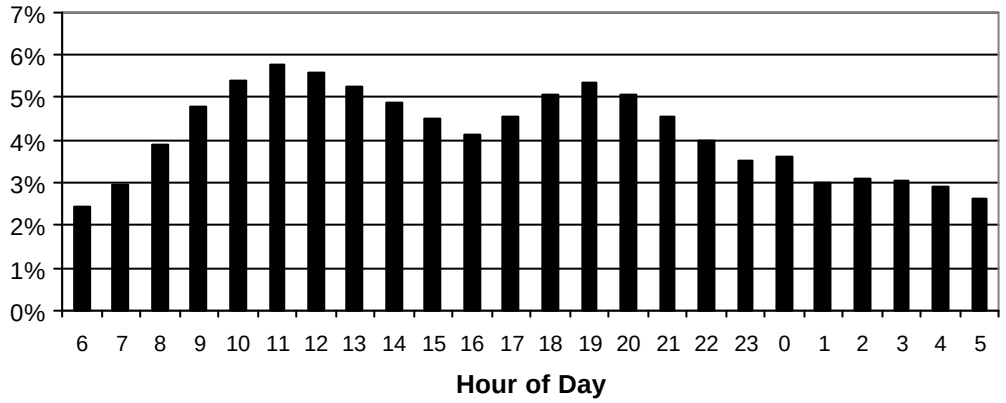
Weighted Estimate Curves Compared to Biased Methods

Figure 3.2 shows the effects of using the weighted estimates approach to look at the *proportion* of all completed burglaries committed in villas by hour of day. The results are not discussed in any detail, but are instead used as a benchmark by which to judge the bias resulting from the use of four inappropriate measures of temporal distribution: the use of (1) Start Time, (2) End Time, (3) the midpoint between Start and End Time, and (4) only those cases where residents can pinpoint the time of burglary to a one-hour window. These methods tend to result in distributions that reflect the occupancy patterns of residents as opposed to the occurrence of burglary. All figures are based on completed burglaries committed against villas in 2002.

Using weighted estimates: the right choice

Use of the weighted estimates approach results in a smooth curve indicating that burglary has two daily peaks: one during the work day and a second peak in early evening.

Figure 3.2: Using Weighted Estimates (n=23,295)

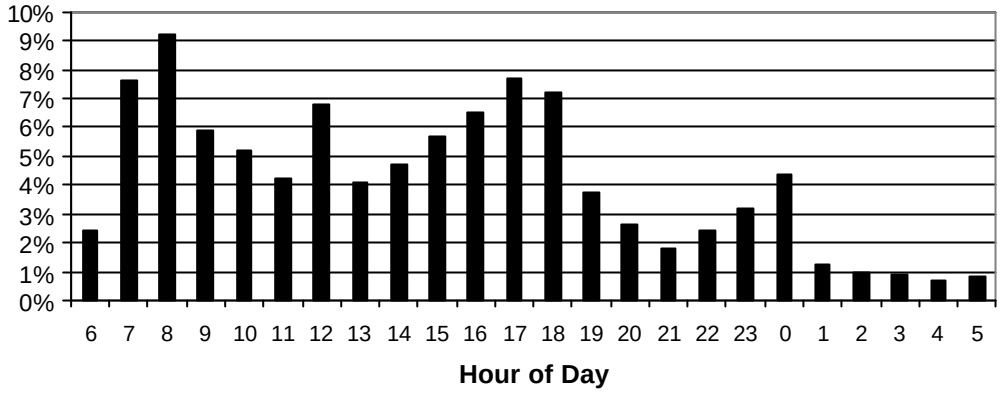


Using Start Time: bad choice

Using Start Time as the indicator of time of occurrence results in a distribution that suggests that burglary peaks at 8:00, with secondary peaks at 12:00, 17:00, and midnight. It does not. What this distribution actually reflects are the times at which people tend to leave their homes: 8:00 – on their way out for work, 12:00 - just after a quick return home on their lunch breaks, and 17:00 - on their way out for the evening's activities. The smaller secondary peak at midnight reflects cases where data for Start Time were unavailable.[11] One thing that none of this reflects is the distribution of burglary across the average day.

[11] POLSAS assigns Start Time as 00:00 in cases where no other data are available. Missing Start Times are common in cases characterized by extended time windows – such as those where residents have been away on vacation. Unlike the weighted approach – which includes these estimates, but assigns them low weight/probabilities due to the breadth of the time window, using Start Time as a measure of time of occurrence assigns them full weight, which accounts for their overrepresentation in Figure 3.2.

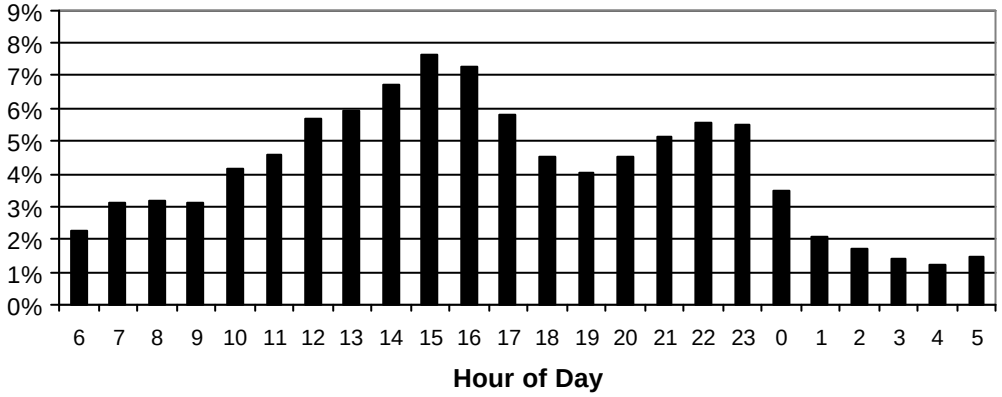
Figure 3.3: Using Start Time (n=23,295):



Using End Time: bad choice

Using End Time as the indicator of time of occurrence merely captures the hours at which people tend to arrive home to find themselves burgled: at 15-16:00 after work and at 22-23:00 after an evening out. These peaks do not represent the times at which burglaries occur. Using the time at which burglaries were reported to police would result in a similar curve, since most burglaries are reported soon after discovery. To the extent that they are not, the distribution produced by use of reporting time would be even more biased than that produced by use of End Time.

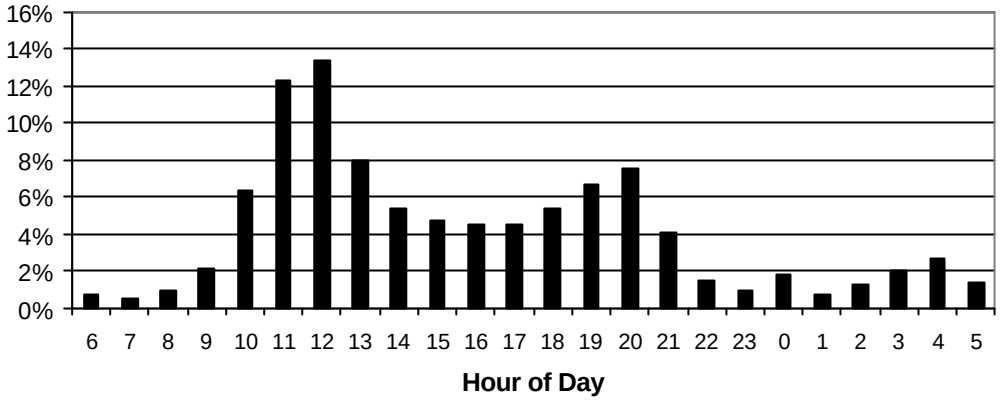
Figure 3.4: Using End Time (n=23,295)



Using the midpoint between Start and End Time: bad choice

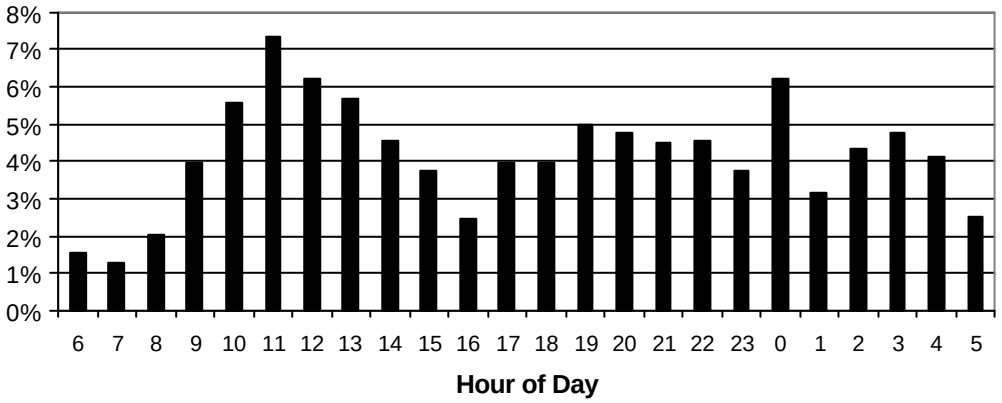
If Start Time is "pjat" and End Time is "pjat," then the midpoint between Start and End Time is the midpoint of "pjat." Using the midpoint of Start and End Time results in the impression that burglaries peak at 12:00 and 20:00. While this comes closer to the truth than either of the last two scenarios, it is largely coincidental, since this curve merely reflects the midpoint between the times that people tend to leave their homes for work/evenings out and the times they tend to return.

Figure 3.5: Using the Midpoint Between Start and End Time (n=14,234)[12]



Using cases where the time window is one hour or less: bad choice
Using only those cases for which hour of occurrence is known results in a drastic loss of data. Use of this technique, in fact, eliminates 87% of the burglary cases available for analysis in this report. Furthermore, the cases retained provide a poor representation of burglary in general. For example, nearly all burglaries committed against households with working residents are eliminated – since these residents are generally unable to specify the exact one-hour period during which they were burgled. While it seems to do a good job of capturing the peak at 11:00, patterns during the evening hours are severely biased. The spike at midnight reflects the heavy weight this technique gives to missing data.[13]

Figure 3.6: Using Cases Where The Time Window is One Hour or Less (n=3,070)



[12] Based on cases for which Start and End Times fall on the same day.

[13] Since POLMAP assigns missing Start/End data as 00:00, such cases qualify as having a Start/End time window of less than one hour. While these missing cases comprise only a small fraction of the full sample of 23,295 villa cases, they are heavily over-represented among cases where Start and End Times lie within the same one-hour period.

Weighted Estimates of Other Temporal Distributions

The weighted estimates approach uses all available data, even where Start and End Periods are very far apart. This means that all temporal analyses – whether they examine hour of day, day of week, or month of year – can be based on the same set of cases. This is important since cases that contribute little to hour of day may contribute significant information to day of week or month of year. Consider the hypothetical case mentioned at the beginning of this section:

- Start: Tuesday December 31, 2002, 20:00
- End: Wednesday January 1, 2003, 02:30

In this case, Start and End are separated by seven one-hour periods. The probability that this burglary occurred during any one of these seven one-hour periods is therefore 1/7, or 0.1429. The probability that it occurred on a Tuesday is 4/7, or 0.5714, since four of the seven hours during which it might have occurred lie on that Tuesday. Likewise, the probability that it occurred on December 31 (as opposed to January 1) or in 2002 (as opposed to 2003) is also 4/7 or 0.5714.

As a final example, consider the following hypothetical data with Start-End Periods separated by 37 one-hour periods:

- Start: Sunday March 31, 2002, 20:00
- End: Tuesday April 2, 2002, 08:15

These data contribute little to the distribution for Hour of Day. Note, however, that the probability that this burglary occurred in March is only 4/37, or 0.1081, since only four of the 37 hours separating Start and End lie in March. Meanwhile the probability that it occurred in April is 33/37, or 0.8919. 89% of the weight for this burglary is therefore attached to April in the distribution produced for month of year. The probabilities that this burglary occurred on a Sunday, Monday or Tuesday are 4/37, 24/37, and 9/37, respectively. Monday therefore receives greater weight in the distribution for day of week than Tuesday, which itself receives more weight than Sunday. The probability that this burglary occurred in 2002 is 1/1=1. The weighted estimates approach uses all of this information, and automatically weights it on the basis of its level of precision in any given context.

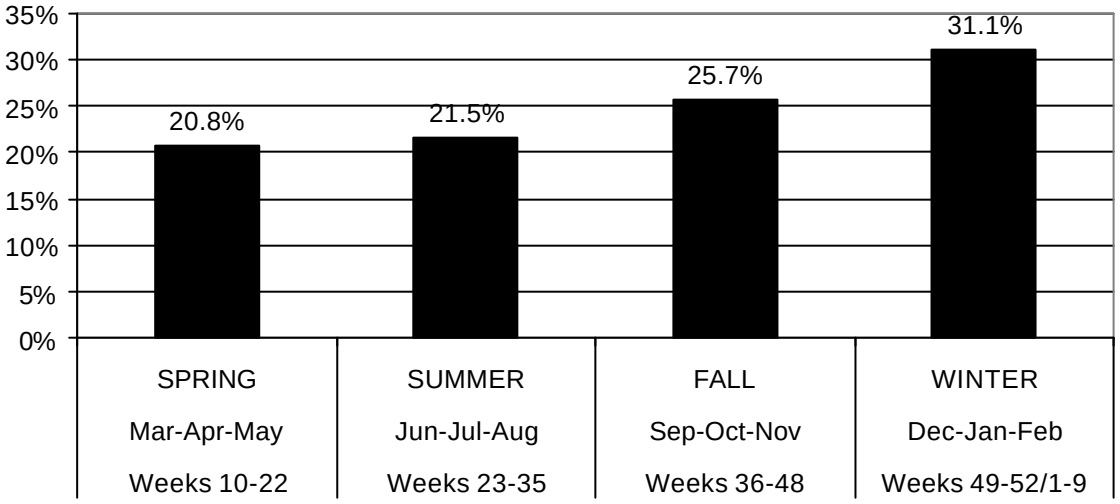
Probabilities for all estimates made in this report are based on the number of hours falling within a given period (day, month, season, etc.). These probabilities are presented as either estimated numbers of burglaries or as proportions of burglaries for a given period depending on the type of analysis (e.g., specific days/weeks versus average days/weeks). It is, however, relatively simple for the reader to convert numbers to proportions and proportions back to numbers.

Section 4: Season, Week, Day, and Month of Year

Burglary by Season

Figure 4.1 shows completed burglaries (hereafter "burglaries") in 2002 distributed by season. Burglars strike less frequently during spring and summer than they do during fall and winter. This is presumably due to a combination of temperature and hours of daylight since the warmer, lighter seasons are characterized by the informal surveillance of garden users, the difficulty of judging home occupancy on the basis of interior lighting, and the lack of cover of darkness. The proportion of burglaries occurring during the spring and summer would probably be even lower if it weren't for the fact that doors and windows are less likely to be shut and locked during these warm seasons. While the proportion of burglaries committed during the summer is slightly higher than that for the spring, the difference is smaller than one might expect given the absence of residents on vacation during the summer months, especially during the Industrial Holiday in July. The peak season for burglary is winter – largely attributable to Christmas.

Figure 4.1: Proportion of Completed Burglaries by Season, 2002 (n=31,081)



Burglary by Week

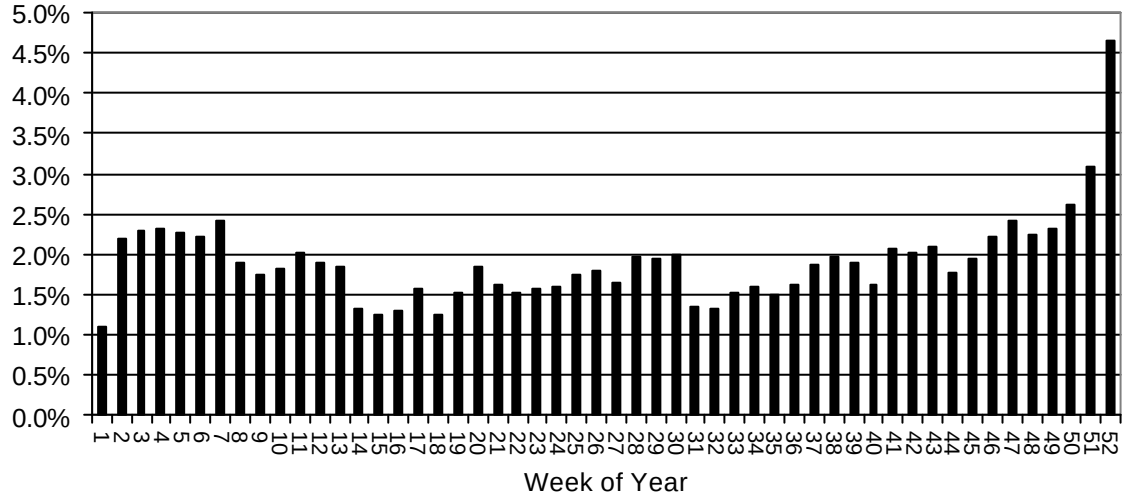
Figure 4.2, which shows the proportion of burglaries reported by week, clearly indicates that Christmas is not only "the children's party," but also "the burglars' party."[14] The most obvious feature is the overwhelming overrepresentation of Week 52 (December 23-29), driven largely by burglaries committed on Christmas Eve and Christmas Day. Table 4.1 shows the dates of other important Danish holidays that help in interpreting the distribution in Figure 4.1.

The first week of 2002 had the fewest burglaries of any week of the year. While this could be interpreted as the burglars' period of rest after the "busy season," it more likely reflects the widespread occupancy of homes – due to the presence of residents worn out from the Christmas Season's social activities. On the other hand, it may be due to

[14] Week numbers are based on official calendar designation, and run Monday through Sunday.

methodological characteristics of this particular sample.[15] Whatever the case, burglary came back into full swing during Weeks 2 to 7 (January 7-February 17). The slight increase at Week 7 probably reflects the Winter School Holiday during which many families are away from home. The proportion of burglaries declined in Weeks 8-13 (February 18-March 31), and then fell again in Weeks 14-18 (April 1-May 5). The overall decline here is likely to be due to increasing hours of daylight. Surprisingly, there is no evidence of an increase during Week 13 (March 25-31), which included the Easter Holiday in 2002.[16] Burglary began to rise again steadily between Weeks 19 and 30 (May 6-July 28), the peak for which is clearly visible during the Industrial Holiday, which covered Weeks 28-30 (July 8-28) in 2002. The reason for the sudden drop at Weeks 31 and 32 (July 29-August 11) is unclear, though it *may* be due to a period of unusually warm temperatures, thus increasing the informal surveillance provided by garden users. The proportion of burglaries increased gradually between Week 31 and the end of the year (July 29-December 29) as the hours of daylight declined. Weeks 41-43 (October 7-27) surrounding the Fall School Holiday at Week 42 (October 14-20) stand out as visibly active, after which the proportion increases gradually to its peak during the Christmas Lunch Season in Weeks 50-52 (December 9-29) and its ultimate peak during the Christmas Holiday itself at Week 52 (December 23-29).

Figure 4.2: Proportion of Completed Burglaries by Week, 2002 (n=31,081)



[15] Since the first day of 2002 was a Tuesday, Week 1 includes only six days – and only three working days. All else being equal, this will lower the proportion of burglaries observed for that week. Furthermore, this sample's basis in cases with Start Dates in 2002 may also contribute to the lower frequency of burglaries for Week 1 since probabilities for cases with Start Dates on New Year's Eve 2001 that were not discovered until New Year's Day or later do not figure in to the estimates for Week 1.

[16] An examination of burglary by day in 2002 shows no evidence for an increase in burglaries on either First or Second Easter Day.

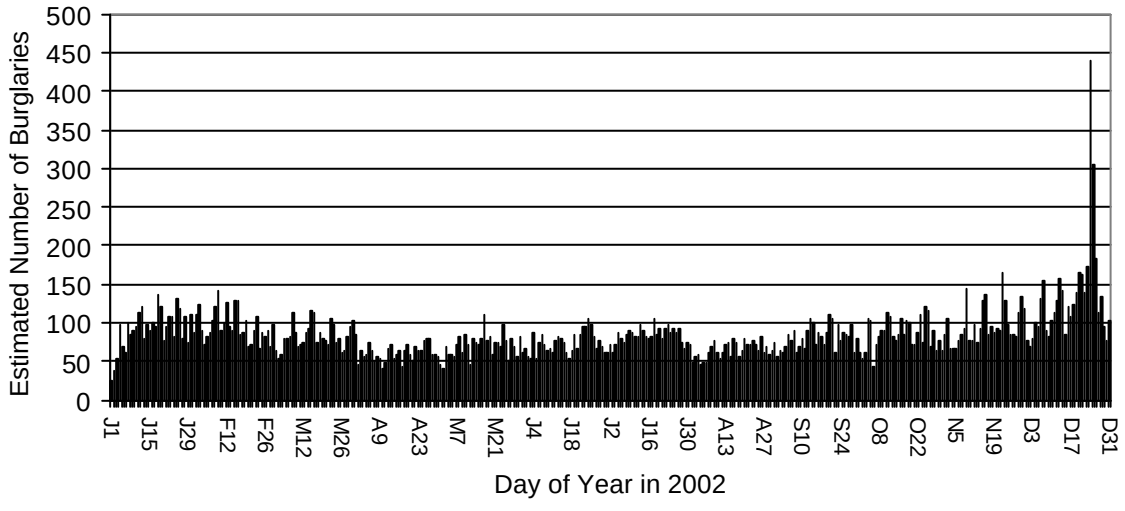
Table 4.1: Weeks of Important Danish Holidays in 2002

Week	Date	Holiday
1	January 1	New Year's Day
7	February 11-17	Winter School Holiday
13	March 28, 29, 31	Maundy Thursday, Good Friday, Easter
14	April 1	Easter Monday
17	April 26	Prayer Day (Store Bededag)
18	May 1	Labor Day
19	May 9	Ascension Day (Kristihimmelfart)
20	May 19	Whitsuntide Sunday (Pinse)
21	May 20	Whitsuntide Monday (2. Pinsedag)
23	June 5	Constitution Day (Grundlovsdag)
28-29-30	July 8-28	Industrial Holiday
42	October 14-20	Fall School Holiday
52	December 24-26	Christmas Eve, Christmas Day, 2nd Christmas Day

Burglary by Day of Year

While rates of burglary are higher than average during the entire month of December, it is important to note that Christmas Eve and Christmas Day are truly exceptional from a standpoint of burglary risk. To make this point clear, Figure 4.3 shows the number of burglaries estimated to have occurred on each day in 2002. The four most active days are December 24, 25, 26, and 23, in that order.

Figure 4.3: Completed Burglaries by Day of Year in 2002 (n=31,081)

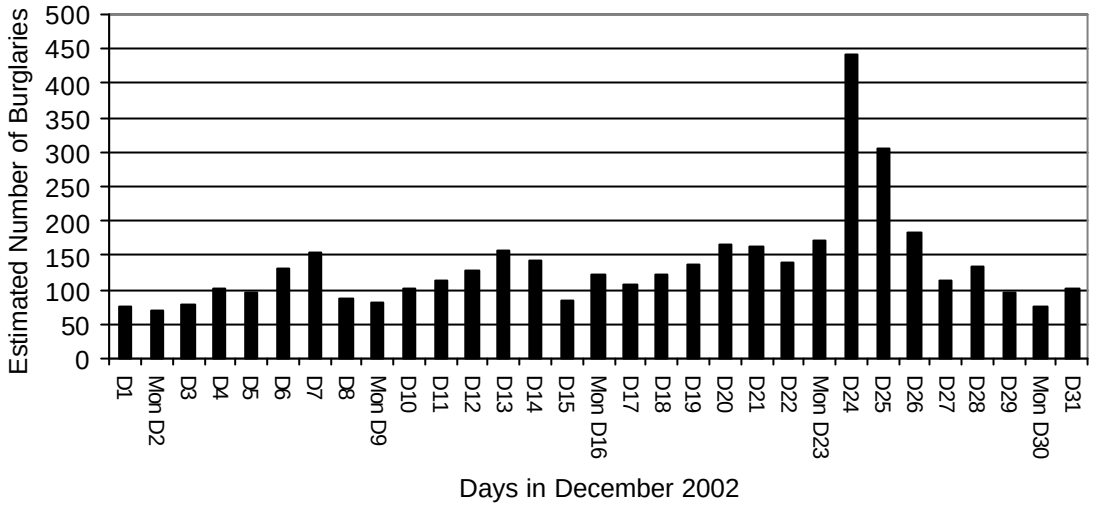


Burglary by Day in December

Figure 4.4 shows the estimated number of burglaries committed during December 2002 beginning Sunday December 1. The peak for each week leading up to Christmas lies on a Friday or Saturday, when many people leave home to attend traditional Christmas lunches. The peak for December clearly falls on Christmas Eve itself (n=441), a day of

large-scale absence from the home. The second busiest day for burglars in December was Christmas Day (n=305) followed by December 26 (n=183), 23 (n=173), and 20 (n=166).[17] For comparison, the average number of burglaries for all days in 2002 was n=85.

Figure 4.4: Completed Burglaries by Day in December 2002 (n=4,187)

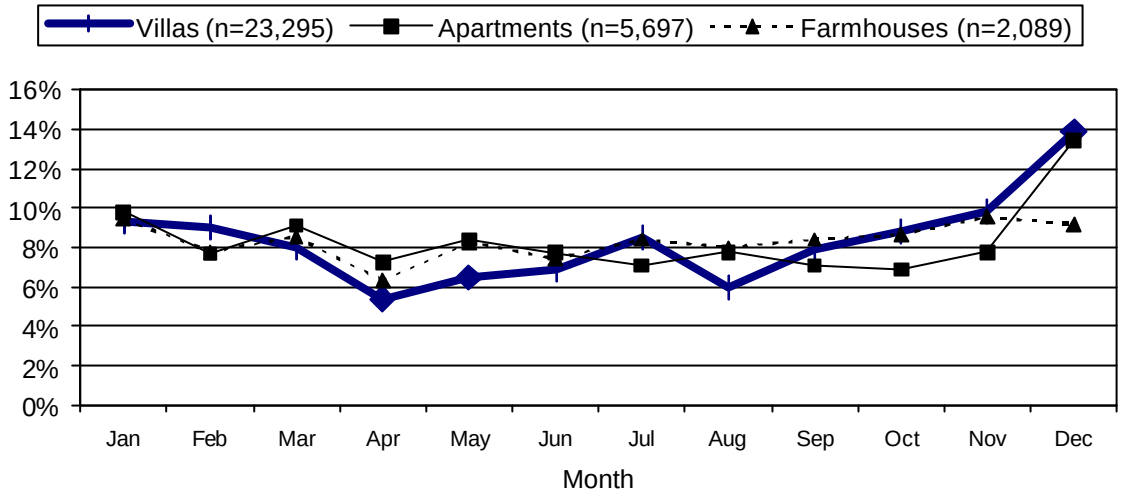


Burglary by Month and Type of Property

The patterns described thus far are largely driven by distributions for villas – which comprise 75% of the burglaries examined in this report. Yet these patterns differ somewhat by property type, as indicated by the monthly proportion of burglaries shown in Figure 4.5. The most obvious difference concerns patterns in December. While burglaries in villas and apartments clearly peak in December, the proportion of burglaries committed against farmhouses is essentially equal to that experienced in January and somewhat lower than that experienced in November. The absence of a Christmas Peak probably reflects occupancy patterns unique to farmhouses. After all, where better to spend an old-fashioned Christmas than with family or friends on the farm. The inclusion of Christmas Eve and Christmas Day in this figure increases the proportion of burglaries designated for December. Nonetheless, December would still easily maintain its rank as the most active month for burglary victimization in villas and apartments even if these two days were excluded.

[17] The frequencies provided are based on probabilistic estimates of the most likely number of burglaries for each day. The frequency for Christmas Day 2002 includes 49 separate burglaries that are known to have happened on that day in a single apartment building used for student housing. Had this unusual event not occurred, the estimated number of burglaries would be reduced to 256. Yet even with this exclusion, Christmas Day would still easily retain its rank as the second busiest day for burglary in 2002.

Figure 4.5: Property-Specific Proportion of Completed Burglaries by Month, 2002 (n=31,081)

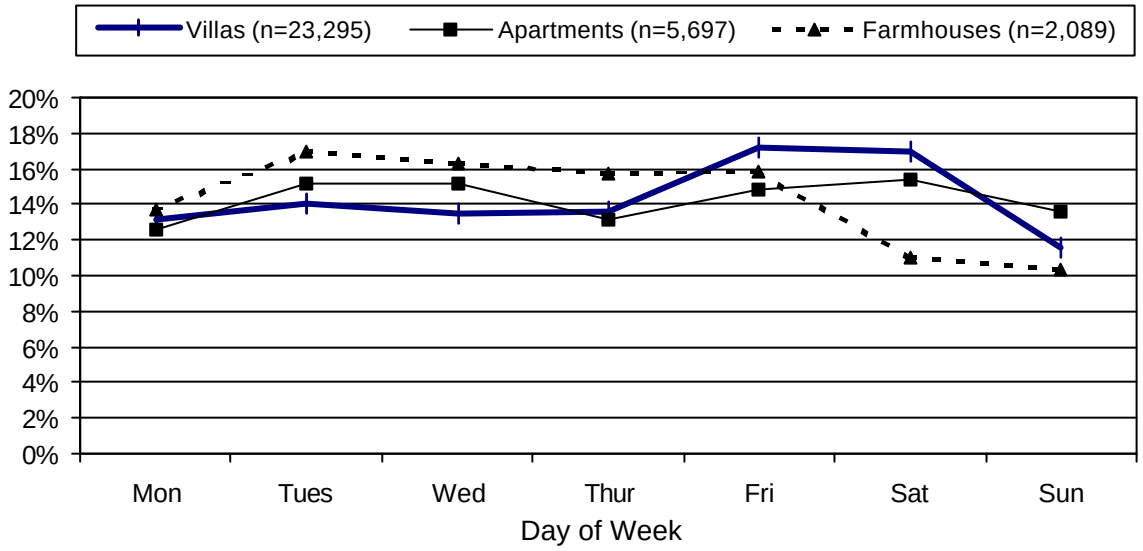


Section 5: Day of Week

Day of Week Including Christmas

Figure 5.1 indicates the proportion of completed burglaries committed by day of the week and type of property in 2002. Burglary in villas is clearly most frequent on Fridays and Saturdays, and least frequent on Sundays. The proportion of burglaries occurring in villas on Mondays through Thursdays is remarkably stable. Contrary to villas, the three most common days for burglary in apartments appear to be Tuesdays, Wednesdays, and Saturdays. This, however, is largely due to the influence of Christmas Eve and Christmas Day, which fell on a Tuesday and Wednesday in 2002.

Figure 5.1: Proportion of Completed Burglaries by Day of Week, 2002 (n=31,081)



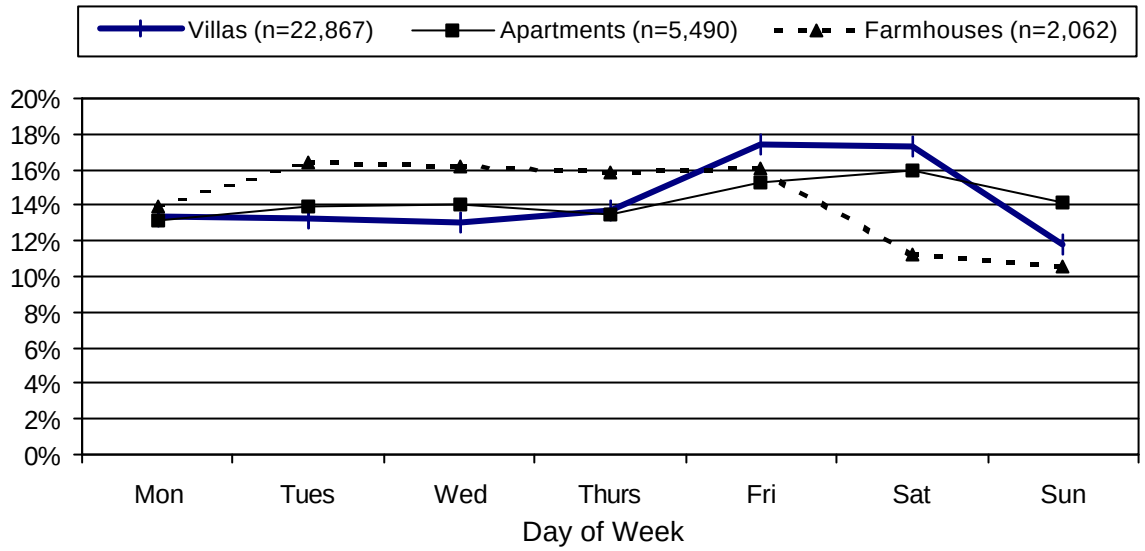
Day of Week Excluding Christmas

Figure 5.2 replicates the data in Figure 5.1, but excludes 662 burglaries that had Start Dates on Christmas Eve and Christmas Day.[18] While the distribution for villas (and farms) is relatively unaffected by this exclusion, the Tuesday and Wednesday peaks for apartments disappear. The peak for apartments now becomes Fridays and Saturdays, like that for villas, though the weekend increase for apartments, and its decrease on Sundays, is not nearly as extreme as that observed in villas.

Burglaries at farmhouses follow a completely different rhythm from those at villas and apartments - peaking during the workweek (Mondays - Fridays) and declining during the weekend (Saturdays and Sundays). The absence of an increase on Fridays and the decrease on Saturdays seems likely to reflect a lesser tendency on the part of farmers as compared to other residents to go out on Friday and Saturday nights.

[18] The 662 burglaries excluded represent 2.1% of the full sample. They include 428 burglaries at villas (1.8% of villas cases), 207 burglaries at apartments (3.6% of apartment cases), and 27 burglaries at farmhouses (1.3% of farmhouse cases).

Figure 5.2: Proportion of Completed Burglaries by Day of Week, 2002, Excluding Christmas Eve and Christmas Day (n=30,419)



Which Figure Should One Rely On?

Whether one should rely upon Figure 5.1 or 5.2 depends on the purpose of one's analysis. If the purpose is merely to chart the distribution of burglaries by day of week for the year 2002, then Figure 5.1 – which includes Christmas Day and Christmas Eve – should be used. After all, these burglaries did occur, occurred on these days, and should therefore be included in the day of week totals. On the other hand, if the purpose is to chart the distribution of burglaries during a *typical* week, Figure 5.2 should be used, since Christmas Eve and Christmas Day are anything but typical. If crime prevention resources were to be allocated differentially by day of week, Figure 5.2 would provide the best basis for doing so – though special adjustments would have to be made during the Christmas season.

Section 6: Hour of Day

The introduction to the weighted estimates approach given in Section 3 (Table 3.2) provided a first look at the distribution of burglaries by hour of day, but made no distinction between different days of the week. Since occupancy patterns differ between workdays and weekends, burglary patterns will differ as well.

This section examines the distribution of burglaries across the 168 (7x24) hours of an average week. All distributions begin at 6:00 on Monday - when both victims and offenders rise to greet the new week - and end at 5:00 on Monday. Since hourly distributions differ by type of property, each property type is examined separately. Since the inclusion or exclusion of Christmas Eve and Christmas Day affects the distributions obtained, each figure depicts both (1) the full year's data, and (2) the full year's data excluding all burglaries with Start Dates on December 24 and 25 – which occurred on a Tuesday and Wednesday, respectively, in 2002.

Burglary in Villas by Hour of Day

Figure 6.1 shows the distribution of burglaries reported in 2002 by hour of day and day of week. The thin line represents all 23,295 burglaries reported in 2002. The dark line drops 428 burglaries (1.8%) with Start Dates on Christmas Eve and Christmas Day, and therefore relies upon a sample of 22,867 cases. This dark line represents the distribution of burglaries by hour across a *typical* week. As it turns out, however, the inclusion/exclusion of data for Christmas Eve/Day makes little difference in these data for villas.

Table 6.1 compliments Figure 6.1 by indicating the absolute peak, secondary peak, and low hours for burglary in villas by day of week. The stability of burglary patterns is remarkable across weekdays. On Mondays through Thursdays, the peak time for burglary each day is 11:00 (technically 11-11:59) while residents are at work. Each of these days, except Thursdays, has a distinct, secondary peak at 19:00 while residents are out for an early evening or working second shift. The secondary peak for Thursday comes at 18:00, though the proportion reported on Thursdays at 19:00 (0.655%) is essentially equivalent to that reported at 18:00 (0.661%). The weekday low for burglary is generally 6:00 – the exception being Wednesdays, when the low point comes at 5:00 (though the proportion of burglaries occurring at 5:00 and 6:00 on Wednesdays is essentially equivalent). The absolute low point for the week is Tuesday at 6:00.

Saturdays are characterized by a completely different pattern – with no midday peak - due to the fact that residents are generally free from work. The peak for Saturday comes at 20:00 while residents are out for the evening. This is, in fact, the busiest hour of the week for burglaries at villas.

Being both a workday and a primary day for evenings out, Fridays exhibit burglary patterns characteristic of both weekdays and weekends. Like Saturdays, the peak for Fridays comes at 20:00 when residents are out for the evening. Yet unlike Saturdays, but like weekdays, there is a secondary, distinct peak at 11:00, while residents are at work.

Being a day for neither work nor evenings out, Sundays follow a pattern completely their own, with a peak at 17:00. The secondary peak for Sundays comes at midnight (the night after Saturday), though this is really just a carry-over from the heavy burglary activity occurring on Saturday nights.

Figure 6.1: Proportion of Completed Burglaries at Villas by Hour and Day of Week, 2002, with and without Christmas Eve and Christmas Day

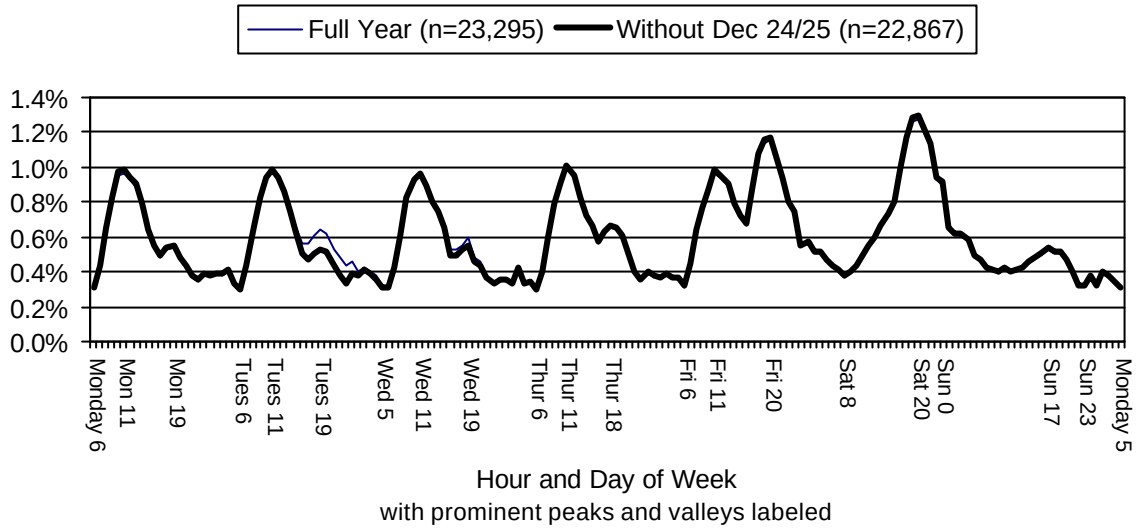


Table 6.1: Hourly Low, Peak, and Distinct Secondary Peak (if any) for Completed Burglaries at Villas by *Day of Week, 2002, Excluding Christmas Eve and Christmas Day (n=22,867)*

	MON	TUES	WED	THUR	FRI	SAT	SUN
Low	6	6	5	6	6	8	23
Peak	11	11	11	11	20	20	0
Distinct 2nd Peak	19	19	19	18	11	NA	17

Burglary in Apartments by Hour of Day

Figure 6.2 shows the hourly distribution of burglaries in apartments, while Table 6.2 indicates peak highs and lows. Hourly patterns are relatively similar to that shown previously for villas, except that the midday weekday peaks tend to come somewhat later in the day – between 12:00 and 14:00 as opposed to 11:00. I have no explanation for the somewhat delayed midday peak in apartments. As with villas, Fridays also exhibit both weekday and weekend characteristics, though the midday peak at 14:00 is slightly higher than the evening peak at 20:00. The absolute peak for the week is at midnight on Sundays, which represents a carry-over from the activities of Saturday nights. When it comes to apartments, the exclusion of data for Christmas Day/Eve makes a significant difference for the distributions shown on Tuesdays and Wednesdays. The very sharp increase in the full year's data on Wednesday at 10:00 is due to the inclusion of 49 separate burglaries reported in an apartment building used for student housing on Christmas Day (Wednesday) 2002 during the 10:00 hour.

Figure 6.2: Proportion of Completed Burglaries at Apartments by Hour and Day of Week, 2002, with and without Christmas Eve and Christmas Day

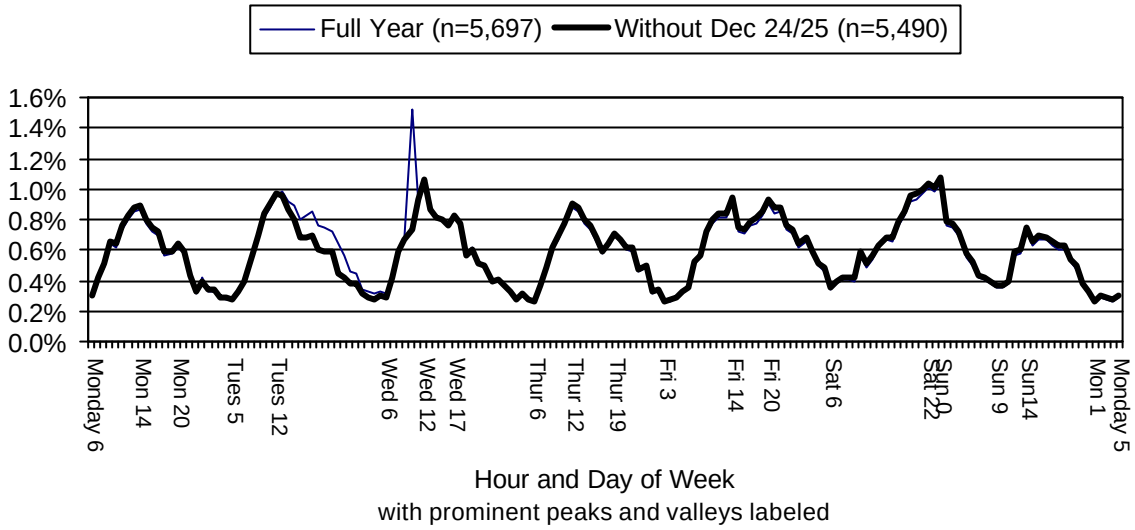


Table 6.2: Hourly Low, Peak, and Distinct Secondary Peak (if any) for Completed Burglaries Apartments by Day of Week, 2002, Excluding Christmas Eve and Christmas Day (n=5,490)

	MON	TUES	WED	THUR	FRI	SAT	SUN
Low	6	5	6	6	3	6	9
Peak	14	12	12	12	14	22	0
Distinct 2nd Peak	20	NA	17	19	20	NA	14

Burglary in Farmhouses by Hour of Day

Figure 6.3 shows the hourly distribution of burglaries in farmhouses, while Table 6.3 indicates peak highs and lows. The hourly distribution of burglaries in farmhouses is quite different from that shown for either villas or apartments. Farmhouses suffer a relatively low rate of burglary on Friday and Saturday nights – presumably reflecting of a lesser tendency for farmers to spend these evenings out. Like villas, weekday peaks in farmhouses are relatively consistent, all falling at 10:00 or 11:00. Note that apart from a small difference on Tuesdays, the inclusion/exclusion of data for Christmas Eve/Day has little influence on the overall patterns presented.

Figure 6.3: Proportion of Completed Burglaries at Farmhouses by Hour and Day of Week, 2002, with and without Christmas Eve and Christmas Day

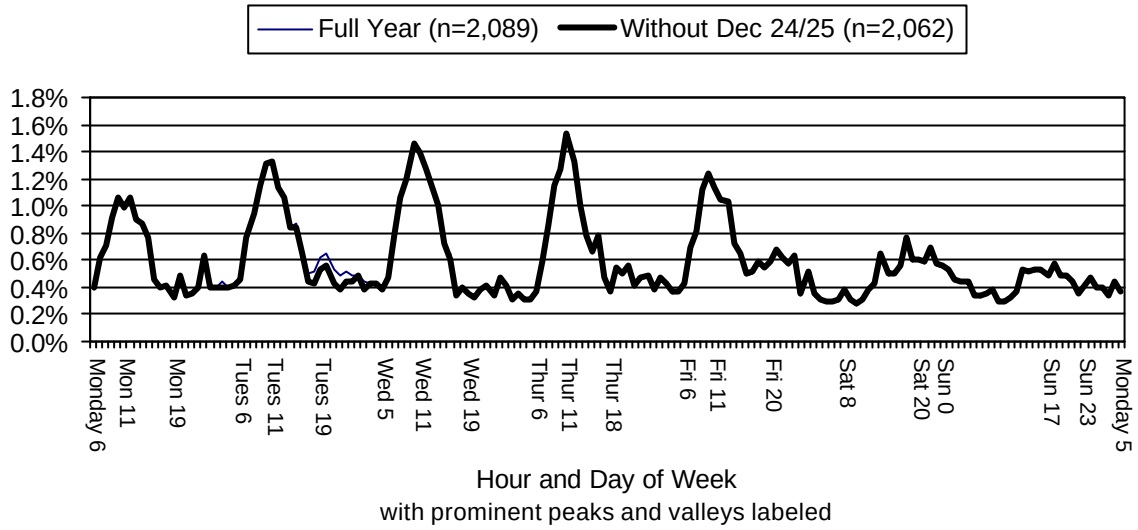


Table 6.3: Hourly Low, Peak, and Distinct Secondary Peak (if any) for Completed Burglaries at Farmhouses by Day of Week, 2002, Excluding Christmas Eve and Christmas Day (n=2,062)

	MON	TUES	WED	THUR	FRI	SAT	SUN
Low	6	2	5	4	4	10	9
Peak	10	11	10	11	10	18	18
Distinct 2nd Peak	20	20	18	16	21	14	0

Hour of Day by Season and Presence of Daylight

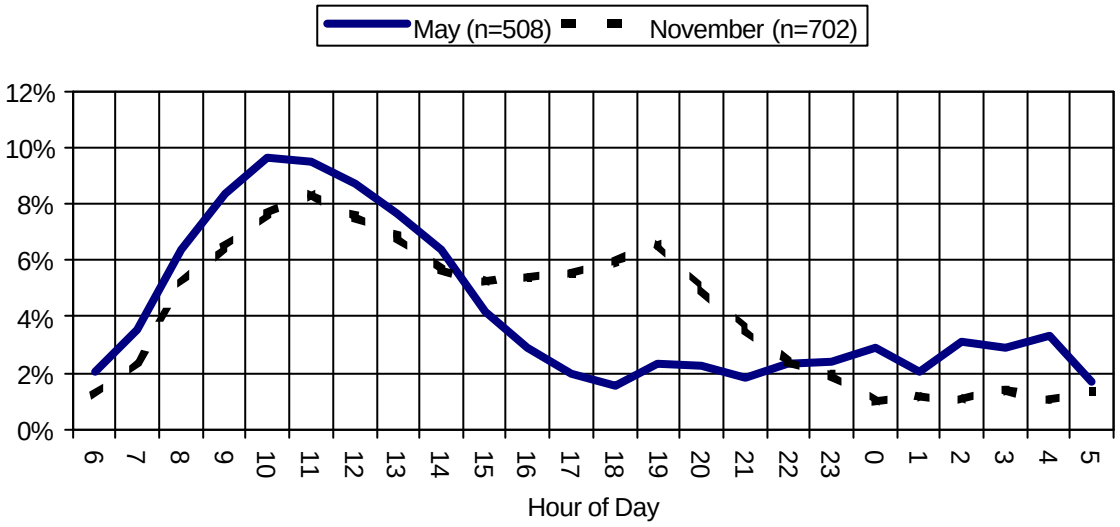
Figure 6.4 shows patterns for completed burglaries in villas by hour of day on Tuesdays, Wednesdays, and Thursdays in May and November 2002, respectively. These months were chosen to reflect typical weekdays during the light season (May) and the dark season (November).[19] Twelve days, evenly distributed among Tuesdays, Wednesdays, and Thursdays, were selected to represent each of these two months, respectively. None of the days in question have holidays just subsequent to them, meaning that the selected days should be comparable. [20]

[19] June and December would have provided the most extreme differences in hours of daylight, but were not chosen for this analysis due to the atypical nature of burglary in December.

[20] I avoided selecting days just prior to holidays because the evenings on these days tend to resemble Friday nights in terms of increased absence from the home. Given the many holidays in May, this required that the first Tuesday selected for May come from a different week than the first Wednesday and Thursday selected for May. The result, however, seems reasonable. Figure 6.4 combines the results of two separate analyses – one based on cases with Start dates on 12 days in May, and the other based on cases with Start dates on 12 days in November. The specific days used in these analyses were:

Figure 6.4 indicates that there were more burglaries on weekdays in November than on weekdays in May – a fact that should not be surprising given the monthly trends already shown in Section 4 (Figure 4.5). Figure 6.4 further indicates that the late morning, weekday peak in burglary is common to both May and November, though it seems to come an hour earlier in May (10:00) than in November (11:00). Most interesting, however, is the absence of any secondary, evening peak for burglary in May. It therefore seems that the secondary, evening peaks observed for villas earlier in Figure 6.1 (which examined hourly patterns averaged over the entire year) were largely due to burglary patterns specific to the season of darkness. These midweek, secondary peaks occurring during the late afternoon/early evening in November take place during hours that would otherwise be light in May. The midweek, secondary peak in November is surprisingly sharp at 19:00 – perhaps reflecting burglars' reasoning that, if residents are out at this time, they will probably remain out throughout the dinner hour. Increased risk during the late afternoon/early evening in November is likely to reflect the ease with which burglars can judge the occupancy of villas at this time of day and year on the basis of interior lighting. The absence of risk during these hours in May probably stems from the reverse of that for November, plus the fact that garden users provide informal surveillance of their own and their neighbors' houses.

Figure 6.4: Proportion of Completed Burglaries at Villas by Hour of Day on Tuesdays, Wednesdays and Thursdays, May and November 2002



A Note on Attempts

Thus far, attempts have been excluded from all of the analyses conducted in this report. Figure 6.5 demonstrates why, by showing hourly patterns for completed and attempted burglaries in villas (excluding Christmas Eve/Day). Prominent peaks for attempts are labeled on the X-axis. While many attempts follow the same hourly pattern as that for

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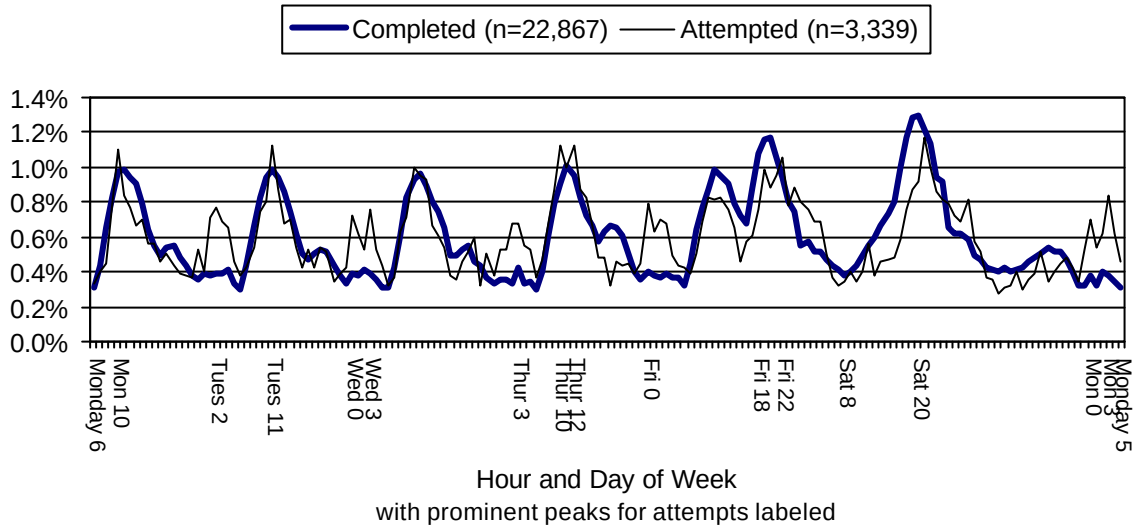
May: Tuesday 7, 14, 21, 28; Wednesday 1, 15, 22, 29; Thursday 2, 16, 23, 30.
November: Tuesday 5, 12, 19, 26; Wednesday 6, 13, 20, 27; Thursday 7, 14, 21, 28.

completed burglaries, a certain proportion do not. This certain proportion of attempts tends to peak during the middle of the night (e.g., Monday 3:00; Tuesday 2:00; Wednesday 3:00; Friday midnight, etc) – when burglars may incorrectly believe that residents are out of their homes. Since completed and attempted burglaries follow a somewhat different temporal rhythm, the combined analysis of "burglary" overall (completed and attempted) would result in a distribution that failed to correctly reflect either one of them.

Figure 6.5 Proportion of Completed and Attempted Burglaries at Villas by Hour and Day of Week, 2002, excluding Christmas Eve and Christmas Day



Section 7: Conclusion

There are very few, if any, temporal patterns that are common to burglary at all three property types examined in this report. While burglaries in villas and apartments peak in December, burglaries at farmhouses are more frequent in both November and January than in December. While burglaries in villas and apartments peak on Saturday nights at 20:00, burglaries at farmhouses peak on Thursdays at 11:00. While weekday burglaries at villas and farmhouses peak at 10-11:00, that peak comes two to three hours later in apartments, at 12-14:00. These differences should not be interpreted as meaningless methodological artifacts of the study's samples or the methods used to examine them. Quite the contrary, they are almost certainly attributable to differences in residential occupancy patterns specific to each particular form of property. One lesson from this report should therefore be that the calculation of *average* trends for burglary – or any other crime, for that matter – should be avoided.

Indeed, temporal patterns differ not only by type of property, but also by season of year, and whether the crime was successfully completed. Further disaggregation, for example by household characteristics or location, would almost certainly solicit an even greater variety of temporal distributions specific to each sub-group examined. On the one hand, too little disaggregation results in a meaningless average of disparate patterns that do not reflect any one of the categories combined to create them. On the other hand, too much disaggregation risks producing so many patterns that it becomes impossible to describe the basic similarities inherent to all. This report has aimed at the middle ground in an effort to provide a balance between the generalizable and the specific.

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Appendix

Table 1: Characteristics of All Cases Classified as Residential Burglary (Indbrud i Beboelse) in 2002, by Property Type (n=52,976)

Type of Property	Row N	Row N as a % of Total	% of Row N that are Attempts	Mean Days Start-End
Primary Full-Time Residences	36,083	68.1%	12.3%	1.8
Villas	26,687	50.4%	12.7%	1.6
Apartments	6,618	12.5%	13.9%	2.1
Farmhouses	2,193	4.1%	4.7%	2.8
Rooms	496	0.9%	5.2%	3.4
Houseboats	89	0.2%	1.1%	3.3
Storage Units	8,337	15.7%	4.5%	8.0
Garages/Sheds	4,065	7.7%	5.1%	4.7
Cellars/Lofts	4,272	8.1%	4.0%	11.0
Non-Full-Time Residences	7,008	13.2%	5.1%	11.9
Free-time houses/colony gardens	6,378	12.0%	5.1%	12.1
Camping trailers/motor homes	405	0.8%	6.9%	10.6
Pleasure boats	225	0.4%	3.6%	6.8
Other	1,548	2.9%	5.6%	2.4
Buildings under construction	324	0.6%	4.6%	2.1
Workman/office trailers	1,224	2.3%	1.4%	2.5
TOTAL	**52,976**	**100.0%**	**9.9%**	**4.1**

Source: POLSAS, 2002

About the Author

Dave Sorensen is an assistant research professor at Research Department III, Faculty of Law, University of Copenhagen. Born and raised in New York City, he has a Bachelor's degree in sociology from the University of Arizona, Tucson, Arizona, and M.A. and Ph.D. degrees in criminal justice from Rutgers University, Newark, New Jersey. His research interests include crime prevention, the versatility of deviance, and longitudinal patterns in criminal careers. Dave's great-great grandfather emigrated from Mors Jylland to the USA in 1878, where he lost his Ø and became a Sorensen.

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