Original Article

International Criminal Justice Review
2025, Vol. 35(1) 29-42

Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/10575677241276858
journals.sagepub.com/home/icj
Sage

Examining the Boost Account for Repeat and Near Repeat Burglary in Canada

Karla Emeno[1], Mari Pullman[1], and Craig Bennell[2]

Abstract

Research suggests that previously burglarized targets, and targets located near such locations, are at an increased risk of being victimized. However, this elevated risk is only temporary and appears to subside over time. The boost account is one theory that attempts to describe the occurrence of repeat, and near repeat, burglaries. The boost account suggests that these burglaries are the result of the same offender returning to burglarize a dwelling that they have successfully burglarized in the past, or one near the previously victimized target. In the current study, we first determined the repeat and near repeat space-time clustering of solved residential burglaries committed in Edmonton, Alberta, Canada, from 2007 to 2008. The results indicate that solved Edmonton burglaries do cluster together in time and space (i.e., residences within 700 m of a previous burgled target are at an increased risk for a period of 7 days). We also investigated whether repeat and near repeat burglaries in the dataset were more likely than distant burglaries to be committed by the same offender. It was found that serial offending by the same offender offers a viable rationale for much of the repeat and near repeat burglaries committed in Edmonton from 2007 to 2008. The practical implications of these results, as well as some limitations and directions for future research, are discussed.

Keywords

near repeat crime, repeat victimization, space–time clustering, crime hotspots

Introduction

Prior research has determined that being burglarized in the past is a significant predictor of being victimized again in the near future; this is known as repeat victimization (Budd, 1999; Townsley et al., 2000). Similar findings have also been identified with near repeat victimization, wherein previously burglarized residences will tend to have additional burglaries cluster around them in time and space for a period of time (Emeno & Bennell, 2018; Johnson & Bowers, 2004). The specific cluster

[1]Faculty of Social Science and Humanities, Ontario Tech University, Oshawa, Ontario, Canada
[2]Department of Psychology, Carleton University, Ottawa, Ontario, Canada

Corresponding Author:
Karla Emeno, 2000 Simcoe St N, Oshawa, Ontario, Canada.
Email: Karla.Emeno@ontariotechu.ca

pattern of burglaries has been found to differ between regions and districts, which suggests that repeat, and near repeat, victimization should be studied across many different samples (Johnson et al., 2007).

The "flag" account and the "boost" account are two rationales that have been proposed for why both repeat and near repeat burglaries occur. In brief, the flag account suggests that repeat (and near repeat) burglaries are due to different offenders being attracted to similar characteristics of a residence (e.g., no neighbors, no alarm system, no dogs; Pease, 1998). The boost account, on the other hand, suggests that these clusters are due to the same offender returning to burglarize properties at the same location or in the same general area (Pease, 1998). The focus of the current study is to determine if the boost account offers a viable rationale for the repeat and near repeat victimization patterns observed in solved burglary cases in Edmonton, Alberta, Canada, during the years 2007 and 2008.[1] The study first assessed whether there was evidence of significant repeat and near repeat victimization within this data. It then aimed to address whether clusters of burglaries found in the data, across both time and space, could be attributed to the same offender returning to the area to commit crimes, which would provide support for the boost account.

Repeat and Near Repeat Victimization

Crime statistics suggest that repeat victimization is not uncommon in Canada, and that many Canadians will be the victim of burglary at some point. This helps highlight the importance of research into repeat and near repeat crime in general, as well as burglary in particular. For example, in 2019, 19% of respondents 15 years and older reported experiencing at least one of the crimes measured by Canada's General Social Survey (i.e., sexual assault, robbery, physical assault, break and enter, theft of motor vehicles or parts, theft of household or personal property, and vandalism; Cotter, 2021). Of these individuals, 42% reported being victimized on more than one occasion within just the 1-year period assessed in the survey, which underscores how a small fraction of victims experiences a disproportionately large amount of the crime that occurs in Canada. This pattern is not unique to Canada and has been detected in both general and violent crime across multiple regions (Farrell & Pease, 1993; Ouderkerk & Truman, 2017). With respect to burglary in Canada, approximately 4.2% of respondents 15 years and older reported being victimized in 2019 (Cotter, 2021). Although rates of repeat burglary victimization in Canada are unavailable, the Royal Canadian Mounted Police in Alberta reported that repeat incidents on the same property comprised one third of all burglaries in the province (Vasylchuk, 2019).

It has been shown across various studies that the risk for repeat burglary victimization is highest during the time immediately following the burglary and declines over time. For example, Kleemans (2001) assessed 174 burglaries that occurred in Enschede, the Netherlands in 1987, and the 840 repeat burglaries (i.e., same dwelling) that followed between 1988 and 1992. He identified that in contrast to the average risk of repeat victimization across the period under investigation, the observed risk was 6.4 times higher in the 1st month, 4.1 times higher in the 2nd month, and 3.1 times higher in the 3rd month following the initial burglary. In another study, Wu et al. (2014) assessed 2,347 burglaries that occurred in Wuhan, China, in 2013 and identified that within seven days of an initial burglary, the risk level of another burglary occurring at the same location was 649% greater than what would be expected by chance. Similarly, Polvi et al. (1990) assessed burglaries that occurred in Saskatoon, Saskatchewan, Canada in 1987 and demonstrated that among repeat burglaries within one month, half were committed within the first 7 days. It is important to note these three studies used slightly different sampling and analytic methods to identify evidence of repeat victimization, which means that a direct comparison across them is not possible. However, the findings from these three studies do suggest that even across different methods and geographic regions, repeat burglary risk is highest immediately following the initial incident and declines overtime.

Previous research has also examined near repeat, as opposed to repeat, burglary. Johnson and Bowers (2004), for example, investigated burglaries that occurred between April 1999 and April 2000 in Merseyside, United Kingdom. They found that houses within 300–400 m from an original burglary were at a greater risk of being burglarized within 2 months of the event. In another study, Johnson et al. (2009) revealed similar results for burglaries that occurred in Bournemouth, United Kingdom, in 2005. Specifically, they found that houses within 400 m of the initial incident were at an elevated risk of victimization for up to 42 days. Similarly, Kuo et al. (2022) identified that for burglaries that occurred between January 2015 and April 2018 in Taoyuan City, Taiwan, homes within 300 m of the initial incident were at an elevated risk for up to 3 weeks. In a comparison between urban and rural near repeat burglaries in the county of Herefordshire, England, a significant pattern was identified up to 7 days from the initial incident across varying spatial bandwidths depending on the density region (Chainey, 2021).

Lastly, Emeno and Bennell (2018) assessed near repeat crime patterns in three Canadian cities and identified that houses within 500 m of an initial burglary in Edmonton, Alberta, were at an elevated risk of victimization for up to 1 week. Although they did not find any significant near repeat space–time patterns for burglary in Moose Jaw, Saskatchewan, and Saint John, New Brunswick, it was speculated that this may have been due to a much smaller number of incidents included in those samples than was observed in the Edmonton crime data.

It is important to note that across studies that have found empirical support for repeat, and near repeat, burglary patterns, the specific spatial and temporal bandwidths that meet statistical significance thresholds have differed. The difference in spatial and temporal bandwidths across studies could be due to a variety of reasons (e.g., general crime rate in the region, how burglaries are coded as "cleared" or "detected," population density, etc.). However, these studies do still provide support for the assertion that there is an elevated risk of repeat and near repeat burglary victimization when the secondary incident is within spatiotemporal proximity of the first, with what is considered spatiotemporal proximity varying across studies.

Accounting for Repeat and Near Repeat Victimization

There are two opposing theories that attempt to account for the occurrence of repeat crime, and repeat burglary in particular, which will be focused on here. They are known as: (a) the risk heterogeneity theory, also referred to as the "flag" account, and (b) the event dependency theory, also referred to as the "boost" account. The risk heterogeneity theory (flag account) suggests that repeat burglary victimization is the result of different offenders burglarizing the same dwelling because of its appealing attributes (Pease, 1998). This theory suggests that there are certain markers (e.g., no nearby neighbors, no alarm system, no dogs) that flag a residence as being a suitable target for an offender (Pease, 1998). In contrast, the event dependency theory (boost account) suggests that repeat victimization is a result of the same offender returning to burglarize the residence again due to a sense of familiarity they have with the location and knowledge that there may be more items of value to take (Pease, 1998).

While the underlying mechanism behind the flag account may be intuitive, the reason why an offender would return to the location of a crime (i.e., boost account), may not be as obvious. However, prior empirical evidence and theoretical frameworks can be used to support the concept that offenders are often motivated to behave in predictable ways in regard to the locations they select. Offenders have been shown to engage in crime in locations they have previously encountered or offended within (Bernasco, 2019; Bernasco et al., 2015; Lammers et al., 2015). Two prominent theories help to ground the boost account: (a) the routine activity theory (Cohen & Felson, 1979) and (b) the optimal foraging theory (Johnson & Bowers, 2004).

Routine activity theory argues that within an environment considered appropriate for criminal activity, crime occurs when a motivated offender's routine activity space intersects, in time and space, with a desirable target's routine activity space in the absence of appropriate guardians (e.g., watchful neighbors, police patrols, security devices, etc.; Cohen & Felson, 1979). An offender's/ target's activity space consists of the area where the offender/target performs their routine daily activities (e.g., reside, work, shop, etc.). As explained by Townsley et al. (2003), routine activity theory predicts that "the greater amount of exposure a potential offender is given to a suitable target the greater the probability of a crime occurring" (p. 618). Thus, according to routine activity theory, burglary is communicable because houses near one another are all located within an offender's activity space, which results in those houses receiving greater exposure to the offender than suitable targets not located in their activity space.

Optimal foraging theory, in contrast, has its origins beyond the criminological context. This theory suggests that an animal will partake in foraging behaviors that will minimize the time and energy required to acquire the maximum amount of energy from food (Ritvo, 2022). This theory has been broadened beyond just foraging in the literal sense to other behaviors that animals, and specifically humans, partake in. Similar to animal foraging, burglars want to minimize the time spent selecting and traveling to an appropriate target while increasing the potential for rewards and reducing the risk of being apprehended (Johnson & Bowers, 2004). One method for achieving these goals is to target houses located near a house the offender has previously burglarized. Burglarizing neighboring houses cuts down on the time spent looking for appropriate targets and familiarity with the area reduces the risk of apprehension. However, to avoid police detection over the long term, Johnson and Bowers (2004) argue that burglars would eventually have to offend in different areas, which may explain why the risk of near repeat victimization decreases over time.

Repeat Burglary. Previous research has examined whether the flag or boost account is more suitable for accounting for repeat burglaries. Studies tend to utilize statistical data or offender accounts to determine whether repeat burglaries are more likely to be committed by the same offender returning to the same residence or multiple distinct offenders being attracted to said residence. Statistical data tends to suggest that the boost account may provide a stronger explanation for repeat victimization. For example, Bernasco (2008) examined solved crime data from The Hague, the Netherlands, and determined that the same offender was responsible for burglarizing the same dwelling in 95% of repeat burglaries occurring within 15 days of the initial offense. Similar findings have been found using solved crime data from Dorset, United Kingdom, where the same offender was responsible for 99% of repeat burglaries committed within 14 days of the initial offense (Johnson et al., 2009).

Kleemans (2001) looked at a longer follow-up time period by evaluating burglaries that occurred in Enschede, the Netherlands, in 1987, and the repeat burglaries (i.e., same dwelling) that followed between 1988 and 1992. He found that the same offender was responsible for 63.2% of the repeat burglaries. Osborn and Tseloni (1998) utilized an alternative approach by analyzing a much larger dataset, the 1992 British Crime Survey. The sociodemographic characteristics of households were used to identify whether modeling risk heterogeneity (i.e., the flag account) could account for the repeat burglary patterns observed. The researchers demonstrated that risk heterogeneity did account for some of the repeat patterning, but it did not explain *all* repeat burglary observed. This finding suggests that other theories, such as the event dependency theory (i.e., boost account), must be considered to fully account for repeat burglary patterns (Pitcher & Johnson, 2011).

Other studies have interviewed apprehended burglars in order to provide insight into whether the boost or flag theory accounts for repeat victimizations. Winkel (1991) found that approximately one-third of residential burglars had returned to burglarize the same dwelling again, and Ericsson (1995) found that 76% of burglars interviewed indicated that they had burglarized the same dwelling on more than one occasion. Thus, both these studies found support for the boost theory accounting for repeat burglary. Through these interviews, many offenders stated that their main reasons for returning to burglarize the same dwelling were to seize items that they had initially left behind, ease of access, and familiarity with the location (Ericsson, 1995).

Near Repeat Burglary. Noticeably less research has been conducted to examine which theory accounts for near repeat, as opposed to repeat, burglary. Of the limited research that has been conducted in this area, much has focused on the boost account. For example, while studying crime data from Bournemouth, United Kingdom, between 2001 and 2005, Johnson et al. (2009) found that burglaries occurring within 100 m and 14 days of one another were more likely to have been committed by the same offender, as opposed to burglaries that occurred at farther points in time and space. Furthermore, in employing a series of discrete mathematical models of burglaries and assessing their outcomes using stochastic agent-based simulations, Pitcher and Johnson (2011) demonstrated that variations in risk alone could not generate space-time clustering (i.e., near repeat) patterns, with a boost component being required to accomplish this.

Overall, crime data and offender accounts seem to provide strong evidence that the boost account is a viable rationale for repeat burglary, but it is important to note that it does not necessarily explain *all* repeat burglaries. Indeed, in conducting a simulation experiment, Johnson (2008) determined that a mixed model (i.e., including a boost and flag mechanism), as opposed to either independent model (i.e., solely a boost or flag mechanism), produced computer-simulated data that was most similar to the real burglary data. It appears these two theories might work in tandem, with the boost account providing an explanation for why the same offender would return to a residence they previously burglarized and the flag account describing why multiple offenders would be attracted to burglarize the same residence in the first place (Lee & O, 2020; Weisel, 2005). While there is some evidence to provide a basis for the existence of the boost account as an underlying rationale for repeat burglaries, more research is still needed in this area. Research examining the boost account for near repeat burglaries is needed as well, as the literature in this area is particularly scarce. In addition, it is worthwhile to examine repeat and near repeat burglaries within various geographic regions, such as in a Canadian context. This is what the current study aimed to do.

The Current Study

The current study first assessed the near repeat space–time clustering of solved residential burglaries committed in Edmonton, Alberta, Canada, during 2007 and 2008. Then, closely following research conducted by Johnson and Bowers (2004) and Johnson et al. (2009), the current study aimed to test the event dependency theory (i.e., the boost account) on this Edmonton crime data to determine whether this accounted for repeat and near repeat burglaries within the city. Thus, the current study included two parts: (a) identifying the exact space–time pattern of solved burglaries that occurred in Edmonton, Alberta, from 2007 to 2008, and (b) identifying whether the same offender(s) are more likely to be responsible for the burglaries occurring closer together in time and space (i.e., repeat and near repeat burglaries) than different offenders.

It is important to note that the crime data used in the current study was derived from the same dataset used by Emeno and Bennell (2018). As previously mentioned, Emeno and Bennell assessed burglary, as well as theft from a motor vehicle and common assault, that occurred in three Canadian cities: (a) Edmonton, Alberta, (b) Moose Jaw, Saskatchewan, and (c) Saint John, New Brunswick. This prior research used data consisting of both solved and unsolved crime, as the sole aim was to identify whether significant near repeat space-time patterns existed across the various crime types and geographic regions examined (i.e., linking each crime incident to a specific offender was unnecessary). In order to test the boost account as an explanation for the occurrence of repeat and near repeat burglary, which was not done in Emeno and Bennell, the current student required the use of only solved burglary data (i.e., linking each crime incident to a specific offender was necessary). The data used by Emeno and Bennell also differed in that it only focused on crime committed in 2007, whereas the current study examined solved burglaries from 2007 and 2008.

Hypotheses

Based on previous findings (e.g., Emeno & Bennell, 2018; Johnson et al., 2009; Johnson & Bowers, 2004), it was expected that a significant repeat and near repeat pattern would be found in the burglary data. As previously mentioned, Emeno and Bennell (2018) relied on crime data consisting of *all* reported burglaries in Edmonton, Alberta, in 2007. This means that the exact space–time pattern found in the current study may differ slightly from that found by Emeno and Bennell, as the current study relied on crime data consisting of only *solved* burglaries that occurred across both 2007 and 2008, as opposed to just 2007. Based on the findings of Johnson et al. (2009), it was also expected that solved burglaries that occurred closer together in time and space would be more likely to be committed by the same offender, as opposed to those that occurred farther apart in time and space. In other words, it was expected that support for the boost account as an explanation for the occurrence of repeat and near repeat burglary would be found.

Method

Data

The final dataset used for this study was provided by the Edmonton Police Service and consisted of 847 solved burglaries committed in Edmonton, Alberta, Canada, between January 1, 2007, and December 31, 2008. Note that attempted burglaries were not included in this dataset to maintain consistency, as this is a separate Criminal Code violation. The data included the geo-coded *x-y* coordinates of the location of each offense offset by a constant value unknown to the researchers for privacy reasons, the date on which each offense occurred, and an offender identifier that linked a specific individual with each offense.

Note that the Edmonton Police Service provided both an "occurrence from" date (i.e., start date) and an "occurrence to" date (i.e., end date), as the exact date on which the burglary had occurred was sometimes unknown (e.g., homeowners were away for an extended period of time and the burglary was noticed and reported upon their return home). In cases where the start and end dates differed, the start date was used as the occurrence date in the current study.

The offender identifier allowed repeat and near repeat burglaries to be matched to a specific offender anonymously. Note that some burglaries were linked to more than one offender identifier, meaning more than one individual committed the offense. All burglaries were classified as either *cleared by charge* or *cleared otherwise*. *Cleared by charge* means that a charge was laid against the offender(s). There are multiple reasons why some burglaries were classified as *cleared otherwise*, such as the death of an offender, an offender under the age of 12, or a complainant who decided not to lay charges.

Procedure

IBM SPSS Statistics (IBM Corp, 2012) was used to generate all crime pairs. For Part 1 of the analysis (i.e., identifying the repeat/near repeat pattern), space–time intervals of 100 m and 1 week were used, which matched those used by Johnson and Bowers (2004). For Part 2, space–time intervals of 100 m and 2 weeks were used to generate the numerical value of crime pairs where the same offender was involved in both crimes, which was consistent with those used by Johnson et al. (2009). Note that the time interval used in Part 2 (14 days) does differ from that used in Part 1 (7 days). An explanation for this difference in temporal bandwidth across the two parts is provided at the end of this section.

Part 1 of the analysis involved determining whether a significant space–time pattern was detected in the Edmonton solved burglary data. To determine this, Ratcliffe's (2009) near repeat calculator was used. The near repeat calculator is based on the revised Knox test (Knox, 1964), which was first developed to determine whether childhood leukemia was a contagious disease. Briefly, the Knox Test was used to determine whether there were more observed pairs of incidents closer together in time and space within the table than would be expected by chance (Knox, 1964). The near repeat calculator is more advanced and uses the temporal and straight line (i.e., Euclidean) spatial distances between crime pairs to create an odds ratio comparing the actual space–time pattern that was observed in the crime data against what would be expected based on chance (identified through Monte Carlo simulations). Ninety-nine iterations were requested in the current study, as well as 100-m and 1-week bandwidths. The near repeat calculator identifies a significant near repeat pattern as being present when the odds ratio of crimes closer in time and space to the initial incident (i.e., cells near the upper left of the matrix) are: (a) equal to or greater than 1.20 and (b) significant at the specified *p*-value (which was .01 in the current study). Random cells farther away from the original crime may also be found to be significant, but they only represent a significant victimization pattern when near a cluster of significant cells and a risk decay pattern is evident. For further clarification, refer to Ratcliffe (2009).

As previously mentioned, Part 2 of this study closely followed research conducted by Johnson et al. (2009). Following this approach for Part 2, every burglary in the current study was compared to every other burglary to form a contingency table using the time and distance between each crime pair. The number of times the same offender was responsible for both offenses within a pair was then marked in the contingency table and turned into a percentage. This percentage represents the proportion of pairs within each space–time interval where the same offender was responsible for both burglaries. This provides a numerical value of whether the same offender was responsible for near repeat offenses, providing a comparison point to determine the viability of the boost account. To make this comparison, the percentages at closer space–time intervals in the contingency table were compared to those at farther space–time intervals to determine whether closer ones were more likely to be committed by the same offender than farther ones.

Recall that bandwidths of 100 m and 2 weeks were used in Part 2. Ideally, space–time intervals of 100 m and 1 week would have been applied in Part 2 to match those used in Part 1. Unfortunately, using 100-m and 1-week intervals resulted in several cells with very few crime pairs (i.e., 3 or less), which meant that the percentages were less informative at those space–time intervals. As a result, the decision was made to use 100 m and 2 weeks instead, which was consistent with those used in the results reported by Johnson et al. (2009). Although this did still result in some cells with very few crime pairs, the issue was less evident than it was with intervals of 100 m and 1 week.

Results

The data consisted of 847 solved residential burglaries committed in the Canadian city of Edmonton, Alberta, from January 1, 2007, to December 31, 2008. This resulted in 358,281 unique crime pairs. In Part 1 of the analysis, the repeat and near repeat space–time patterns for this burglary data were determined. A summary of the observed over mean frequencies (odds ratios), along with their respective significance value (*p*-value) calculated using Ratcliffe's (2009) near repeat calculator, is presented in Table 1. As previously highlighted, a significant near repeat pattern is detected when the odds ratio of crimes spatiotemporally closer to the initial incident are: (a) equal to or greater than 1.20 and (b) significant at the specified *p*-value (which was .01 in the current study).

Table 1. Odds Ratios of Space–Time Clustering of Solved Burglary Data (Edmonton, Alberta, Canada).

	Number of days				
Distance (in m)	0–7	8–14	15–21	22–28	29–35
Same location	7.5**	2.97	5.211		
1–100	8.185**	1.684	0.647	0.669	1.467
101–200	4.593**	0.697	0.495	1.266	1.707
201–300	2.878**	0.839	1.021	0.975	1.348
301–400	3.825**	1.042	1.355	1.209	1.047
401–500	3.389**	0.751	1.12	0.602	1.106
501–600	2.154**	0.737	1.166	1.038	0.735
601–700	2.248**	1.248	1.343	1.034	0.872
701–800	1.867*	1.107	0.686	0.552	0.795
801–900	1.369	1.026	0.926	1.216	1.325
901–1000	1.082	1.603*	1.111	1.266	0.788
1001–1100	1.111	1.129	0.916	1.049	1.148

* $p \leq .05$, ** $p = .01$.
Note. A *p*-value of .01 is the best possible statistical probability level for the chosen number of iterations (i.e., 99).

As shown in Table 1, the results of this analysis revealed that significant space-time clustering was present in the Edmonton solved burglary data. Specifically, residences within 700 m of an initial burglarized dwelling (i.e., near repeat victimization) were at an increased risk of burglary for 7 days following the incident. Within the week following the initial incident, the odds of the same residence being burglarized (i.e., repeat victimization) were 7.5 times what would be expected by chance if time and location were irrelevant. The odds of residences within 100, 101–200, 201–300, 301–400, 401–500, 501–600, and 601–700 m from the initial incident were 8.19, 4.59, 2.88, 3.83, 3.39, 2.15, 2.25, and 1.87 times greater than what would be expected, respectively.

Part 2 of the analysis included identifying the percentages of burglary pairs for each space–time interval for which one or more offenders were responsible for both offenses. The results of this analysis can be seen in Table 2. A value of zero would indicate that no burglary pair within that specific space–time interval had the same offender(s) responsible for both offenses. Alternatively, a value of 100 would mean that in every pair of burglaries within that space–time interval, the same offender(s) were responsible for both. Table 2 presents the results based on space–time intervals of 100 m and 2 weeks, which differs from the Part 1 time interval of 1 week. However, a table depicting the Part 2 findings based on space–time intervals of 100 m and 1 week is available upon request from the first author.

In terms of repeat burglary, Table 2 suggests that the same offender(s) were responsible for 75% of all crime pairs that occurred within 0 to 14 days of one another at the same location. This means that for a given pair of crimes that occurred at the same location between 0 and 14 days of one another, there was a 75% chance that both burglaries had been committed by the same offender(s). Although not shown in Table 2, this percentage increases to 83.3% when relying on a 1-week temporal bandwidth instead (i.e., within 0 to 7 days). As well, repeat burglaries that occurred within 15 to 28 days of one another also had a 75% chance of being committed by the same offender(s). Finally, although not shown in Table 2, the same offender(s) were responsible for 83.3% of all repeat burglary within 0 to 7 days.

Table 2 also shows that crime pairs that appeared closer in time and space (i.e., cells toward the upper left of the contingency table) were more likely to have been committed by the same offender(s) as opposed to crime pairs that took place farther apart in time and space (i.e., cells toward the lower right). More specifically, crime pairs occurring within 800 m and 14 days of one another revealed the

Table 2. Percentage of Burglary Pairs for Each Space–Time Interval Where One or More Offenders Were Involved in Both Offenses (Edmonton, Alberta, Canada).

	Days between offenses								
Distance between offenses	0–14	15–28	29–42	43–56	57–70	71–84	85–98	99–112	>112
Same	75.00	75.00	0.00	100.00	0.00	0.00	–	–	8.00
1–100 m	74.07	25.00	33.33	0.00	0.00	0.00	0.00	0.00	1.08
101–200 m	59.09	0.00	0.00	0.00	7.69	0.00	0.00	0.00	0.74
201–300 m	40.74	0.00	7.69	0.00	5.56	0.00	0.00	0.00	0.81
301–400 m	36.17	4.17	9.09	0.00	0.00	0.00	0.00	0.00	0.00
401–500 m	48.78	5.88	0.00	0.00	0.00	0.00	7.69	0.00	0.54
501–600 m	36.36	0.00	0.00	0.00	0.00	0.00	11.11	0.00	0.18
601–700 m	38.60	2.78	0.00	3.85	3.85	0.00	0.00	0.00	0.52
701–800 m	42.31	5.26	0.00	0.00	3.45	0.00	0.00	3.03	0.16
801–900 m	21.62	5.41	0.00	3.57	0.00	0.00	0.00	0.00	0.00
901 m–1 km	31.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
>1 km	0.59	0.48	0.26	0.11	0.03	0.04	0.03	0.03	0.06

Note. There were no crime pairs that occurred at the same location between 84 and 112 days of each other.

highest percentages of being carried out by the same offender. For example, the same offender(s) were responsible for 74% of all crime pairs that occurred within 1 to 100 m and zero to 14 days of one another. Although not shown in Table 2, when focusing specifically on the crime pairs that fall within the significant space–time near repeat pattern identified in Part 1 (i.e., all crime pairs within 1 to 700 m and 0 to 7 days), 57.3% of them were linked to the same offender(s).

Discussion

Overall, the findings of this study support previous research that has identified significant repeat and near repeat burglary patterns (e.g., Emeno & Bennell, 2018; Johnson & Bowers, 2004; Kleemans, 2001; Kuo et al., 2022; Polvi et al., 1990, etc.). Consistent with Johnson et al. (2009), the results of the current study provided support for the boost account of repeat and near repeat burglary, with crime pairs that occurred closer together in time and space being more likely to have been committed by the same offender(s) than more distant ones. In other words, the current study found significant repeat and near repeat space–time patterns to be present in the solved burglary data from Edmonton, Alberta, and the results also found the boost account to be a sound rationale for these repeat and near repeat burglaries.

As expected, the current study found a significant repeat and near repeat space–time pattern in the burglary data. Specifically, the same residence was at a significantly increased risk of being victimized again for a period of 7 days following the initial burglary. Residences within 700 m of the location of the initial burglary were also found to be at a significantly increased risk of being burglarized for up to 7 days after the incident. This significant near repeat pattern of 700 m and 7 days is similar to the results obtained by Emeno and Bennell (2018), where near repeat space–time clustering of 500 m and 7 days was found in the same region. The difference in the exact space–time patterns observed was likely due to the fact that the Edmonton crime data used in the current study did differ somewhat from that used in Emeno and Bennell. As previously mentioned, the current study used solved burglary data from 2007 and 2008, whereas Emeno and Bennell used all reported burglary data from 2007.

The current study also identified that pairs of burglaries occurring within 800 m and 14 days of one another had the highest chances of being committed by the same offender(s). In other words, the percentages of crime pairs committed by the same offender(s) were typically highest in cells that represented crimes closest in time and space. Focusing specifically on the crime pairs located within the significant space-time pattern detected in Part 1 (i.e., within 1 to 700 m and 0 to 7 days), over half were linked to the same offender(s). Overall, these findings suggest that the boost account is a viable rationale for repeat and near repeat burglary in the Edmonton area.

Limitations and Future Research Directions

The results from this study are promising and seem to suggest that the boost account is a viable rationale for the detected near repeat clustering. However, as with any study, there are some key limitations that must be acknowledged. Some of these limitations are inherent to any research involving the use of crime data, which means they are not exclusive to near repeat research. For example, crime research typically requires the use of reported crimes, particularly when quantitative analyses are involved. However, not all crimes are reported to the police. Although the rates for reporting burglary are typically quite high (e.g., 82% when something is stolen, 79% when nothing is stolen; Home Office Statistics, 2011), the current study required crime data consisting of not just reported burglaries, but it also required *solved* reported burglaries in order to tie each burglary to a specific offender. The need for solved reported burglary data in the current study could have further impacted the ability to generalize the findings, beyond just what is expected when relying on reported crime data.

There is also a range of solve rates depending on community demographics and types of crime, which is an additional limitation of using solved crime data (Paré et al., 2007). For example, smaller communities tend to have higher clearance rates than larger urban areas, and violent crimes tend to have higher clearance rates than property crimes (Paré et al., 2007). This again highlights how even if a large proportion of burglaries were reported to the police, the current study was further limited by the fact that it could only use data from those that had been solved by the police. The Edmonton Police Service provided not only the data for all cleared cases, but for all reported burglaries between 2007 and 2008, which made it possible for the authors to calculate the difference between the two. In 2007 and 2008, the combined rate of reported burglaries in Edmonton, Alberta, that were cleared by charge or cleared otherwise was 10.6%. Therefore, approximately 90% of reported residential burglaries during this timeframe were not considered to be cleared by charge or cleared otherwise, which meant they could not be included in the current study. Thus, it is unknown whether the pattern of results observed in this study only applies to solve burglaries and cannot be generalized to unsolved burglaries.

Some additional limitations should also be noted. First, as previously mentioned, the temporal bandwidth used in Part 1 (i.e., 1-week interval) differs from that used in Part 2 (i.e., 2-week interval). Unfortunately, using a 1-week time interval for Part 2 resulted in too many low-frequency cells, which meant that the percentages were less informative at those space–time intervals. Using a 2-week time interval resulted in fewer problematic low-frequency cells, and it was also consistent with the temporal bandwidth used in the results reported by Johnson et al. (2009). Key findings using a 1-week time interval were included to partially address this limitation. We encourage future researchers to replicate this research using spatiotemporal bandwidths that are consistent across both parts of the study. Although not the focus of the current study, future researchers could also examine various spatiotemporal bandwidths in order to systematically assess the impact on the findings. Having a dataset with a greater volume of crime than the one used here could prove helpful for future research in this area.

Second, the current study only focused on burglary and the results cannot necessarily be generalized to nonproperty crimes. Although Johnson et al. (2009) did find the boost account to be a viable explanation for repeat and near repeat burglaries and theft from a motor vehicle in Bournemouth, United Kingdom, it is possible that the same would not be found in other geographic regions and for other crime types (in particular, nonproperty crimes). More research should be conducted to determine whether the boost account is a sound explanation for the occurrence of repeat and near repeat crime for other crime types and across different locations, as well as for more recent time periods than what was examined in Johnson et al. and in the current study. As previously noted, attempted burglaries were not included in this study to maintain consistency, as this is a separate Criminal Code violation. That said, an offender's motivations for successful and attempted burglaries are arguably the same. Thus, future researchers should also consider including attempted burglaries as a part of their dataset.

Lastly, and importantly, the current study focused on determining whether there was support for the boost account and not on testing the flag account. This means that the flag account cannot necessarily be ruled out as a potential explanation for repeat and near repeat burglaries in Edmonton. As previously mentioned, the flag account states that repeat and near repeat crime is due to different offenders targeting the same or a nearby residence, respectively. As seen in Table 2, even with crime pairs that occurred closer together in time and space, not all pairs could be attributed to the same offender. Thus, the boost account could not explain *all* the repeat and near repeat burglaries that took place. In line with what has been suggested by Lee and O (2020) and Weisel (2005), this indicates that the boost and flag accounts may still need to be considered in tandem to fully explain repeat and near repeat crime.

As much of the existing literature, along with the current study, does assess whether the boost theory can account for the occurrence of repeat and near repeat burglaries, additional research should be conducted to determine the viability of the flag theory more directly. Alternatively, more research could be conducted using a mixed-method approach in order to study both the boost and flag explanations to determine whether they do collectively account for repeat and near repeat crime. This future research could include a focus on offender motivations, choice of targets, and other socioenvironmental variables.

Practical Implications

The repeat and near repeat patterns identified, when considered in conjunction with other near repeat research (e.g., Emeno & Bennell, 2018; Johnson & Bowers, 2004; Kleemans, 2001; Kuo et al., 2022; Polvi et al., 1990), could certainly be valuable in terms of informing police agencies about high-risk locations to patrol and how to best allocate resources to deter future crime. While the exact repeat and near repeat patterns observed in the current study would only be valuable for residential burglaries in the Edmonton area during the time period examined (i.e., 2007 and 2008), police jurisdictions could use their recent crime data to determine specific space–time clustering for various crime types within their geographic region to inform effective police strategies and resource allocation. Furthermore, the finding that the same offenders were responsible for a disproportionate amount of repeat and near repeat burglaries in the data also provides further support that monitoring offenders who may be known to police for being repeat burglars could be an effective crime prevention strategy, particularly if those offenders are detected in burglary hotspots.

Conclusion

The current study used crime data from the Canadian city of Edmonton, Alberta, to test: (a) whether there were significant repeat and near repeat space–time patterns of residential burglaries and (b) if the boost account was a viable explanation for any space–time clustering that was found. Overall, the results provided further evidence of the existence of the repeat and near repeat phenomenon, as well as support for the boost account as an explanation for the space–time clustering of crime. Although the findings suggest that repeat and near repeat patterns can be used to inform effective police resource allocation when determining where future burglaries may take place in the near future and by whom, more research should be conducted to determine whether the findings generalize across a variety of geographic regions and crime types, as well as for more recent crime.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Social Sciences and Humanities Research Council of Canada.

ORCID iD

Karla Emeno https://orcid.org/0000-0003-4291-337X

Note

1. Note that the official legal terminology for this type of crime under the Criminal Code of Canada is "break and enter." However, the language of "burglary" will be used in this paper to stay consistent with previous literature that has assessed this type of crime.

References

Bernasco, W. (2008). Them again?: Same-offender involvement in repeat and near repeat burglaries. *European Journal of Criminology*, *5*(4), 411–431. https://doi.org/10.1177/1477370808095124

Bernasco, W. (2019). Adolescent offenders' current whereabouts predict locations of their future crimes. *PloS One*, *14*(1), Article e0210733. https://doi.org/10.1371/journal.pone.0210733

Bernasco, W., Johnson, S. D., & Ruiter, S. (2015). Learning where to offend: Effects of past on future burglary locations. *Applied Geography (Sevenoaks)*, *60*, 120–129. https://doi.org/10.1016/j.apgeog.2015.03.014

Budd, T. (1999). Burglary of domestic dwellings: Findings from the British Crime Survey. https://popcenter.asu.edu/sites/default/files/tools/repeat_victimization/PDFs/Budd_1999.pdf.

Chainey, S. P. (2021). A comparison of burglary near repeat victimization between rural and urban areas using a target-based assessment of criminal opportunity. *International Criminal Justice Review*, *31*(4), 405–419. https://doi.org/10.1177/10575677211041920

Cohen, L. E., & Felson, M. (1979). Social change and crime rate trends: A routine activity approach. *American Sociological Review*, *44*(4), 588–608. https://doi.org/10.2307/2094589

Cotter, A. (2021). Criminal victimization in Canada, 2019. https://www150.statcan.gc.ca/n1/pub/85-002-x/2021001/article/00014-eng.htm.

Emeno, K., & Bennell, C. (2018). Near repeat space-time patterns of Canadian crime. *Canadian Journal of Criminology and Criminal Justice*, *60*(2), 141–166. https://doi.org/10.3138/cjccj.2017-0009

Ericsson, U. (1995). Straight from the horse's mouth. *Forensic Update*, *43*, 23–25.

Farrell, G., & Pease, K. (1993). Once bitten, twice bitten: Repeat victimisation and its implications for crime prevention. https://popcenter.asu.edu/sites/default/files/problems/domestic_violence/PDFs/Pease_1998.pdf.

Home Office Statistics. (2011). *Crime in England and Wales 2010/11: Findings from the British Crime Survey and police recorded crime* (2nd ed.).

IBM Corp. (2012). *IBM SPSS statistics for windows*. In (Version 21.0) IBM Corp.

Johnson, S. (2008). Repeat burglary victimisation: A tale of two theories. *Journal of Experimental Criminology*, *4*(3), 215–240. https://doi.org/10.1007/s11292-008-9055-3

Johnson, S. D., Bernasco, W., Bowers, K. J., Elffers, H., Ratcliffe, J., Rengert, G., & Townsley, M. (2007). Space–time patterns of risk: A cross national assessment of residential burglary victimization. *Journal of Quantitative Criminology*, *23*(3), 201–219. https://doi.org/10.1007/s10940-007-9025-3

Johnson, S. D., & Bowers, K. J. (2004). The burglary as clue to the future: The beginnings of prospective hot-spotting. *European Journal of Criminology*, *1*(2), 237–255. https://doi.org/10.1177/1477370804041252

Johnson, S. D., Summers, L., & Pease, K. (2009). Offender as forager? A direct test of the boost account of victimization. *Journal of Quantitative Criminology*, *25*(2), 181–200. https://doi.org/10.1007/s10940-008-9060-8

Kleemans, E. R. (2001). Repeat burglary victimization: Results of empirical research in the Netherlands. *Crime Prevention Studies*, *12*, 53–68.

Knox, E. G. (1964). The detection of space-time interactions. *Journal of the Royal Statistical Society*, *13*(1), 25–29. https://doi.org/https://doi.org/10.2307/2985220

Kuo, T.-L., Sidebottom, A., Wortley, R., & Tsai, T.-M. (2022). Repeat and near repeat burglary victimization in Taiwan. *Asian Journal of Criminology*, *17*(3), 293–309. https://doi.org/10.1007/s11417-022-09364-9

Lammers, M., Menting, B., Ruiter, S., & Bernasco, W. (2015). Biting once, twice: The influence of prior on subsequent crime location choice. *Criminology (Beverly Hills)*, *53*(3), 309–329. https://doi.org/10.1111/1745-9125.12071

Lee, Y., & O, S. (2020). Flag and boost theories for hot spot forecasting: An application of NIJ's real-time crime forecasting algorithm using Colorado Springs crime data. *International Journal of Police Science & Management*, *22*(1), 4–15. https://doi.org/10.1177/1461355719864367

Osborn, D. R., & Tseloni, A. (1998). The distribution of household property crimes. *Journal of Quantitative Criminology*, *14*(3), 307–330. https://doi.org/10.1023/A:1023086530548

Ouderkerk, B. A., & Truman, J. (2017). Repeat violent victimization, 2005-14. http://www.bjs.gov/content/pub/pdf/rvv0514.pdf.

Paré, P.-P., Felson, R. B., & Ouimet, M. (2007). Community variation in crime clearance: A multilevel analysis with comments on assessing police performance. *Journal of Quantitative Criminology*, *23*(3), 243–258. https://doi.org/10.1007/s10940-007-9028-0

Pease, K. (1998). Repeat victimisation: Taking stock. https://popcenter.asu.edu/sites/default/files/problems/domestic_violence/PDFs/Pease_1998.pdf.

Pitcher, A. B., & Johnson, S. D. (2011). Exploring theories of victimization using a mathematical model of burglary. *The Journal of Research in Crime and Delinquency*, *48*(1), 83–109. https://doi.org/10.1177/0022427810384139

Polvi, N., Looman, T., Humphries, C., & Pease, K. (1990). Repeat break and enter victimization: Time course and crime prevention opportunity. *Journal of Police Science and Administration*, *17*, 8–11.

Ratcliffe, J. H. (2009). Near repeat calculator. In (Version 1.3) Temple University, Philadelphia, PA and the National Institute of Justice, Washington, DC.

Ritvo, S. (2022). Optimal foraging theory. In J. Vonk, & T. K. Shackelford (Eds.), *Encyclopedia of animal cognition and behavior* (pp. 4833–4838). Springer International Publishing.

Townsley, M., Homel, R., & Chaseling, J. (2000). Repeat burglary victimisation: Spatial and temporal patterns. *Australian & New Zealand Journal of Criminology*, *33*(1), 37–63. https://doi.org/10.1177/000486580003300104

Townsley, M., Homel, R., & Chaseling, J. (2003). Infectious burglaries. A test of the near repeat hypothesis. *British Journal of Criminology*, *43*(3), 615–633. https://doi.org/10.1093/bjc/43.3.615

Vasylchuk, P. (2019). *RCMP project aims to reduce repeat break-ins*. Royal Canadian Mounted Police. https://www.rcmp-grc.gc.ca/en/gazette/rcmp-project-aims-reduce-repeat-break-ins?wbdisable=true.

Weisel, D. L. (2005). Analyzing repeat victimization. https://popcenter.asu.edu/sites/default/files/analyzing_repeat_victimization.pdf.

Winkel, F. W. (1991). Police, victims, and crime prevention: Some research-based recommendations on victim-orientated interventions. *British Journal of Criminology*, *31*(3), 250–265. https://doi.org/10.1093/oxfordjournals.bjc.a048115

Wu, L., Xu, X., Ye, X., & Zhu, X. (2014). Repeat and near-repeat burglaries and offender involvement in a large Chinese city. *Cartography and Geographic Information Science*, *42*(2), 178–189. https://doi.org/10.1080/15230406.2014.991426

Author Biographies

Karla Emeno is an associate professor ins Forensic Psychology at Ontario Tech University. She received her MA and PhD in Psychology at Carleton University. Her research focuses on investigative and crime prevention techniques, as well as various key topics in policing.

Mari Pullman is a PhD student in Forensic Psychology at Ontario Tech University where she also obtained her MSc in Forensic Psychology. Her research generally includes using quantitative methods to assess and predict the incidence of crime as well as offender patterns and trajectories.

Craig Bennell is a professor in the Department of Psychology at Carleton University. Together with his students in the Police Research Lab, Craig studies topics related to evidence-based policing, with a current emphasis on improving police responses to community members experiencing mental health crises. He currently serves as co-editor for *Applied Police Briefings*, which is designed to get important policing research into the hands of police professionals, free of the scientific and statistical jargon that often makes such research inaccessible.