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Spatiotemporal Analysis of Burglary in Multifamily Housing in Fukuoka City, Japan

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Abstract

Although previous studies have referred to the spatiotemporal patterns of burglaries called "repeat victimization" (RV) and "near repeat" (NR), only a few have explicitly dealt with multifamily housing, and none of them have distinguished among RV of a dwelling-unit, victimization of another unit in the same building, and NR in a nearby building. This work examined the spatiotemporal patterns of burglaries in multifamily housing in Fukuoka City, Japan, at both the building and dwelling-unit levels. The data were provided by the Fukuoka Prefectural Police of 8,845 cases that occurred between 2005 and 2014. The number of burglary incidents in previously burgled multifamily buildings and in previously burgled dwelling units accounted for 31% and 8.4% of all incidents, respectively. The results of the building-level analysis showed NR patterns in nearby buildings, even after excluding victimization of other units in the same building, in a spatiotemporal range of 200 m and 60 days. The results of the dwelling-unit-level analysis verified a significantly high risk of RV of a unit in 160 days and around twice as high a risk of victimization of other units in the same building in almost 80 days. Thus, this study showed the risk of RV and NR in multifamily housing, which would contribute to the literature in that it expanded the scope of the RV/NR model in detached housing that has been proposed in previous studies. Finally, recommended measures against RV and NR of burglaries in the Japanese context and the research limitations are discussed.

Keywords

Repeat victimization, Near repeat, Cocoon neighborhood watch, Neighborhood association, Privacy, Japan

1. Introduction

During the period of rapid economic growth in Japan in the 1960s, a large part of the rural population migrated into metropolitan areas. Subsequently, both public and private companies constructed several multifamily housing structures one after another. In addition, the asset price inflation in the latter half of the 1980s created a great boom for high-rise condominiums based on the myth that their price would decidedly rise. Thus, multifamily housing became a general alternative in metropolitan areas in Japan. Recent compact city policy strategies, which national and municipal governments seek in response to the growing aging population and increasing demands on the environment, would further add to the percentage of people living in multifamily housing.

Notably, this type of metropolitan housing has been the site of a higher rate of residential burglaries in Japan. In Tokyo, a representative metropolitan area in the country, 34.7% of burglaries in 2016 occurred in multifamily housing (Metropolitan Police Department, 2017). Nationwide, the percentage of residential burglaries among the reported burglaries was 56.7%, of which 40.6% occurred in single family housing and 16.1% in multifamily housing. Although the number of residential burglaries has decreased by 58.6% in the ten years leading up to 2016, the percentage of people who reported fear of residential burglaries and perceived their risk is 70.6% and 37.0%, respectively, represented the second highest among the 20 categories of crime in both questions (Nikkoso Foundation for Safe Society, 2015).

In general, the same type of crime incident is likely to be experienced by the same victim within a specific period; such a crime pattern is called repeat victimization (RV). Burglary is a typical crime in which RV occurs besides crimes such as sexual assault, robbery, vehicle crime (thefts of/from), and vandalism (Weisel, 2005). Repeat burglary is attributed to risk heterogeneity (continuing attractiveness of households) and event dependence, where offenders learn that a target is attractive at first victimization (Morgan, 2001; Short et al., 2009; Tseloni et al., 2004). High burglary counts in so-called hot spot areas are often attributed to a high number of repeat burglaries (Bennett, 1995). From the offenders' perspective of RV, they are more likely to commit a burglary in residences near their address, and the same tendency draws them to committing a repeat burglary (Kleemans, 2001).

In addition, the same type of crime incident is likely experienced by other targets within a specific spatiotemporal distance from the first victim; such a crime pattern is called a "near repeat" (NR). A number of studies have been conducted on NR of burglary (Johnson & Bowers, 2014) as well as gun assaults (Wells et al., 2012) and street robberies (Glasner & Leitner, 2016). The cause of NR burglary has also been explained in studies focusing on offenders: the same offenders are involved in NR incidents (Bernasco, 2008) and burglars are more likely to commit a burglary near their own home (Bernasco et al., 2015). Other studies consider the physical and social factors of NR burglary (Nobles et al., 2016; Piza & Carter, 2017); the following factors have been reported to be attractive for burglars: a number of commercial facilities in the vicinity, proximity to public transport (Rummens et al., 2017), street connectivity, neighborhood visibility (Peeters & Vander Beken, 2017), urban intelligibility (Chang, 2011), and average value of the dwelling (Malczewski & Poetz, 2005). NR burglary pattern has been measured quantitatively in Western countries, such as the USA (Short et al., 2009), the UK (Johnson & Bowers, 2004), Sweden (Hoppe & Gerell, 2018), the Netherlands (Bernasco, 2008), and Australia (Townsley, 2003). In addition to these, Johnson et al. (2007) demonstrated the ubiquity of this phenomenon by analyzing space–time patterns of burglary in 10 areas in five Western countries. Other than in Western countries, few other countries too have conducted such studies: for example, Brazil (Chainey & da Silva, 2016) and China (Chen et al., 2013; Wang & Liu, 2017; Wu et al., 2015; Ye et al., 2015); however, there has been no such study in Japan because of the difficulty involved in data acquisition. A study in Japan would contribute to the literature given the marked differences between the levels of RV in different cities and countries (Mawby, 2001).

Partly owing to this bias in countries where previous studies were conducted, most of them have dealt with detached housing, and only a few have explicitly dealt with multifamily housing. Hoppe and Gerell (2018) regarded incidents in the same multifamily housing, which may involve two or more different dwelling units, as repeat incidents. This method did not distinguish incidents in the same dwelling unit from those in other dwelling units in the same building. Chainey and da Silva (2016) referred to incidents in different dwelling units of a multifamily building, but did not distinguish incidents within a building from those near the building. Thus, previous studies did not separate burglaries in the same unit from those in other units or in nearby buildings. Understanding these risks more precisely would contribute to the literature in that it expands the scope of the RV/NR model in detached housing, which has been proposed in previous studies. Considering that previous studies have reported occurrences of NRs mainly in suburbs containing homogeneous housing (Townsley, 2003) and that there is, although very slight, a heightened risk for properties that share the same internal layout as previously victimized properties (Bowers & Johnson, 2005), multifamily housing, in which all dwelling units usually have almost the same building parts and internal layout, would be more vulnerable to NR burglaries. Moreover, households are more concentrated in multifamily housing than in detached housing areas and can be accessed one after another through a common section. Thus, to draw up plans to prevent burglaries in an area with a high rate of multifamily housing, NR phenomena need to be understood precisely. To do this, a new approach to identify NR at both the building and dwelling-unit levels is necessary.

Based on previous studies, the present work aimed to examine spatiotemporal patterns of burglaries in multifamily housing in Fukuoka City, Japan, at both the building and dwelling-unit levels. Specifically, two research questions were posed: the first, at the building level, was whether NR patterns were found in nearby buildings after excluding victimization of other units in the same building. The second research question, at the unit level, was whether RV of a unit occurred, and, if it did, how did its spatiotemporal patterns differ from the victimization of other dwelling units in the same building. By focusing on multifamily housing, which is the general alternative in high-density cities in Asia, the present study contributes to existing literature on the spatiotemporal analysis of burglary.

2. Materials and Methods

2.1 Data

The study area was Fukuoka City, which is the capital of Fukuoka Prefecture, situated toward the north of Kyushu Island in southeast Japan. It is the most populous city on the Island and the sixth in Japan, with a population of about 1.57 million people in 794,000 households (as of January 2018) (Fukuoka City, 2017). The research analyzed 8,845 burglaries in multifamily housing in Fukuoka City between January 2005 and December 2014. According to the National Census in 2010, 76.5% of households in Fukuoka City lived in multifamily housing. Burglary data were provided by the Fukuoka Prefectural Police within the Crime Prevention Research Adviser Framework, which was initiated in October 2014 to solve problems through cooperation between the police and designated academic advisers. This framework is the first attempt in Japanese prefectural police policy to provide data with spatiotemporal information, which is not usually disclosed, to designated academics. The police categorize the types of victimized buildings into three: detached houses, multifamily buildings with four or more floors, and those with less than four floors. Among them, this study analyzed incidents that occurred in the latter two categories. According to the Housing and Land Survey in 2013, 14% of multifamily buildings in Fukuoka City had two floors, 29% had three to five floors, 35% had six to ten floors, and 22% had more than eleven floors. High-rise buildings tend to be condominiums near major stations and low-rise buildings tend to be rental apartment buildings, particularly for young or single member households. Many mid-rise buildings are located in *danchi*, which are public-housing complexes that absorbed the flow of people toward the suburban metropolitan areas during the period of rapid economic growth in late 1960s and 1970s (Botting, 2003).

The Japanese address is based on a series of areas starting from a prefecture (*ken*) to a city (*shi*), a primary neighborhood (*cho*), a secondary neighborhood (*ban*), and a parcel (*go*)

(Kikuchi, 2015). In the case of multifamily housing, building name, building number (if any), and unit number follow the above-explained address format. Ahead of the analysis, the data were cleaned using the following procedure: 1) Dividing the location information to the address, building name, building number (if any), and the unit number of the burgled households; 2) Modifying errors or omissions of address (318 cases) and/or building names (1,140 cases) by referring to maps and real estate information on the internet; 3) Specifying the latitude and longitude after comparing their precision with that (a) recorded in police data, (b) acquired using Google Geocoding, and (c) acquired using the address matching service by the Center for Spatial Information Science, the University of Tokyo.

As the precise time of burglary cannot be known in most cases, the data include a possible interval of time (for example, between the departure and arrival times of the family member(s)). The time of burglary is randomly selected within the possible interval of time because this method leads us to a more approximate measure of the time of the burglary than by selecting the beginning, middle, or end of the interval (Boldt & Borg, 2016).

2.2 Definition

This study classified spatiotemporally focused burglaries in multifamily housing into four categories:

(1) Repeat victimization of a building (RV-b): Victimization of a building more than once in

a certain period of time

(2) Near repeat in another building (NR-b): Victimization of a building within a certain spatiotemporal distance from another victimization in another building

(3) Repeat victimization of a dwelling unit (RV-d): Victimization of a dwelling unit more than once in a certain period of time

(4) Near repeat in the same building (NR-d): Victimization of a dwelling unit in the same building of another victimized unit in a certain period of time from another unit's victimization

2.3 Analysis

To address the two research questions posed earlier, two corresponding analyses were conducted. The first analysis (analysis A) was conducted at the building level to examine RV-b and NR-b: 8,118 burglaries in multifamily housing were analyzed without distinguishing dwelling units in a building. A total of 113 cases were excluded; those with addresses whose latitude and longitude could not be specified at the parcel (*go*) level with any of the three abovementioned options were also excluded because analyses of this study required the precise location of the burgled building. Additionally, 333 cases without building names, as well as 281 cases in *danchi* areas were excluded because they could not be treated along with other cases owing to the vastness and uniformity of the buildings and the residents' socioeconomic status. The second analysis (analysis B) was conducted at the dwelling-unit level to examine RV-d and NR-d; 6,487 burglaries in multifamily housing were analyzed distinguishing separate dwelling units in a building, where incidents in a dwelling unit in a building of another burgled unit was regarded as NR-d. Cases without unit numbers from the 8,118 cases analyzed in analysis A were excluded. In examining the temporal pattern in both analyses, A and B, cases without dates were also excluded, reducing the number of cases to 7,902 in analysis A and 6,487 in analysis B.

An overview of the characteristics of the victimized households was created. Then, the distribution of the number of times burglary occurred and the spatiotemporal patterns of the burglaries were presented in both analyses A and B. To examine spatiotemporal patterns, the near repeat calculator (NRC) (Ratcliffe, 2009), which is built on the Knox test (Knox, 1964) and incorporates Monte Carlo simulation approach in the significant test, was used, as in previous studies (Chainey & da Silva, 2016; Hoppe & Gerell, 2018; Moreto, Piza, & Caplan, 2014; Wu et al., 2015). The NRC compares the observed and expected value of the burglary under the null hypothesis that there is no difference between them, in other words, incidents occur based on a random space–time distribution and are not spatiotemporally clustered. The observed value is the distribution of the spatiotemporal distances between $n(n-1)/2$ pairs selected from n burglaries that actually occurred. The expected value is obtained using the same procedure after the random shuffling of the relationships between the places and the times of *n* burglaries on the assumption that burglaries occur in a spatiotemporally random pattern. Repeating calculation of the expected value 999 times and then obtaining their average would reveal the risk of a specific spatiotemporal band with observed/expected ratio (Knox ratio).

In analysis A, the spatial bandwidth was set at 100 meters (1,000 meters at the maximum), following previous studies. The NRC provides Manhattan and Euclidean distance values as distance parameters for analysis. The current work chose the Manhattan distance, which offers better approximation for actual travel distance in cities with a grid road network (Miyagawa, 2010; Vaughan, 1987). The central part of Fukuoka City was burnt to ashes at the end of World War II, and a land readjustment project was subsequently carried out in an area of 330 hectares, forming a grid road network (Fukuoka City, 2012). The fact that a large bay runs inland into the city was another reason for this choice of method.

In analysis B, the spatial distances were classified into three categories: the same unit, other units in the same building, and other buildings. Units in a building were distinguished by giving unique and minute differences in latitude and longitude values for each. When selecting $n(n-1)/2$ pairs from n burglaries, the sum of RV-d pairs and NR-d pairs equals the number of RV-b by definition.

Meanwhile, the temporal bandwidth was set at 10 days in both analyses to investigate longer effects (200 days at the maximum) compared with previous studies.

3. Results

3.1 Overview

Figure 1 shows a kernel density map of the spatial distribution of burglaries in the study area. Regarding the characteristics of the victimized households, the percentage of one-person households occupied by a male aged in his twenties was high (Table A.1). Approximately half of the burgled units were on the first (ground) floor. In comparing the victim rate calculated from the number of households in Fukuoka City in the National Census in 2010, the risk of one-person households was higher than the whole by 3%, and units situated lower than the fourth floor had more than four times a higher risk compared with those on higher floors (Table A.2). In the temporal distribution of the possible time intervals of burglary, the 9–12-hour interval was the most frequent one during which burglaries occurred. Nearly 4.5% of the burglaries occurred within the one-hour interval; also, another 4.5% occurred when the interval was more than 30 days (Table A.3).

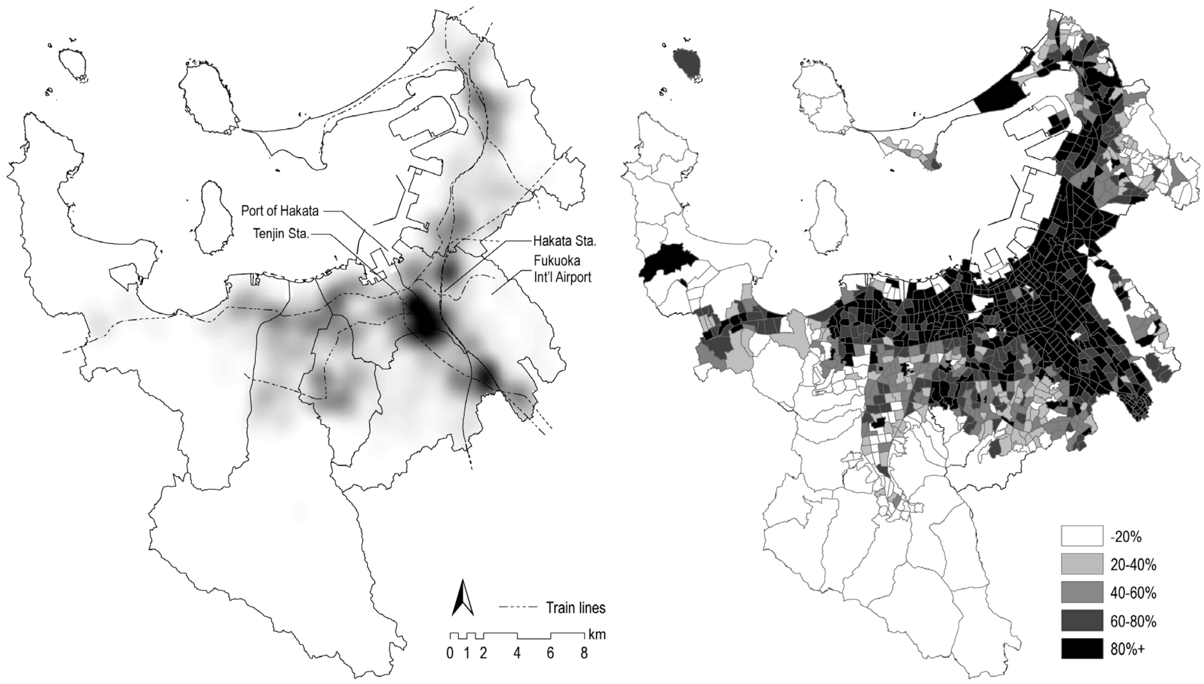

Fig. 1

Kernel density map of burglaries in multifamily housing (with 1 km bandwidth; left) and rate of households living in multifamily housing by neighborhood (right) in Fukuoka City

3.2 Analysis A

Table 1 shows the number of times burglaries occurred in a building in 10 years. The number of RV-b was 2,533 (8,118 – 5,585), equivalent to 31% of the number of burglaries. The percentage of burgled buildings in which burglaries occurred twice or more was 27%; 91 buildings were burgled as many as five times or more. These findings indicated that 50% of the burglaries were focused on 27% buildings. Analysis using NRC revealed a clear NR-b phenomenon in almost all cells in the spatiotemporal range of 200 m and 60 days at the 1% significance level, as shown in Figure 2. Especially, during the first 10 days, the risk was significantly high within up to 1,000 m. Additionally, the data showed the RV-b phenomenon; units in the same building of a burgled unit had significantly higher risk for around 140 days.

Table 1

Distribution of the number of times burglary occurred (Analysis A: *N* = 8,118 in 5,585 buildings)

Times burgled (a)	Num. of buildings (b)		Num. of burglaries (a) * (b)	
1	4,059	72.7%	4,059	50.0%
2	1,024	18.3%	2,048	25.2%
3	307	5.5%	921	11.3%
4	104	1.9%	416	5.1%
5	46	0.8%	230	2.8%
6	13	0.2%	78	1.0%
7	10	0.2%	70	0.9%
8	7	0.1%	56	0.7%
9	3	0.1%	27	0.3%

≥10	12	0.2%	213	2.6%
Total	5,585	100%	8,118	100%

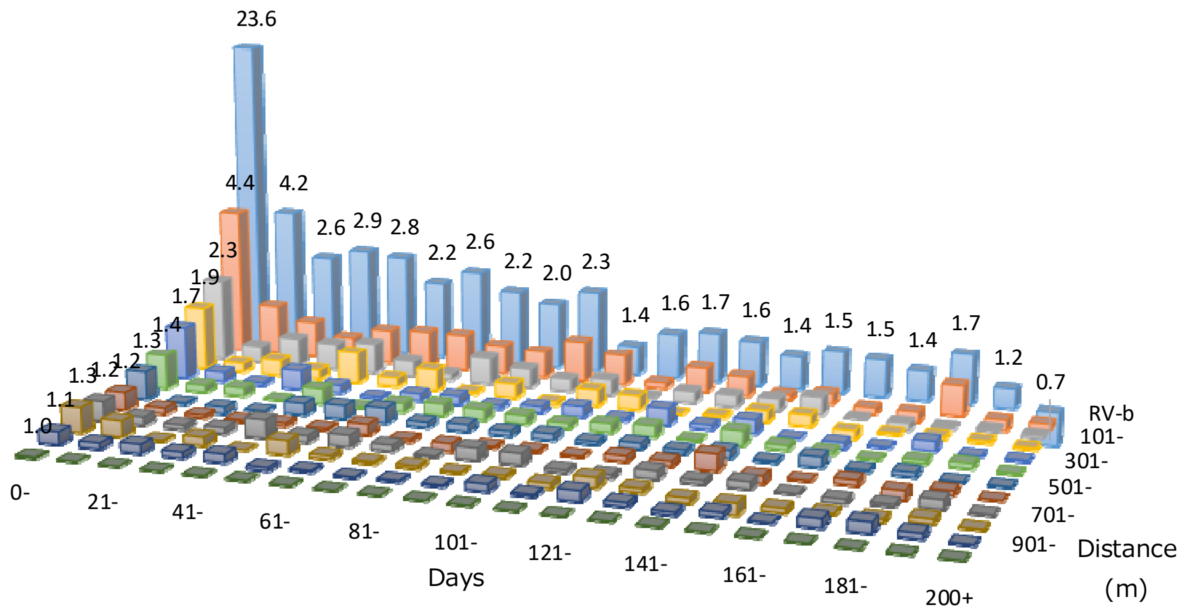

Figure 2

Knox ratio in each spatiotemporal band (Analysis A)

Note: The data in this figure are shown in Table A.4.

3.3 Analysis B

Table 2 shows the number of times burglaries occurred in a unit in 10 years. The number of RV-d was 560 (6,661 – 6,101), equivalent to 8.4% of the number of burglaries. The percentage of units that were burgled twice or more was 6.9%, on which 15% of the burglaries were focused and 75 units were burgled as many as three times or more.

Table 2

Distribution of the number of times burglary occurred (Analysis B: *N* = 6,661 in 6,101 units)

Times burgled (a)	Num. of units (b)		Num. of burglaries (a) * (b)	
1	5,679	93.1%	5,679	85.3%
2	347	5.7%	694	10.4%
3	53	0.9%	159	2.4%
4	8	0.1%	32	0.5%
5	5	0.1%	25	0.4%
≥6	9	0.0%	72	0.1%
Total	6,101	100%	6,661	100%

NRC analysis showed an RV-d phenomenon in 160 days at the 1% significance level, as represented in Figure 3. Periodic peaks were seen from 41 to 50 days, 111 to 120 days, and 181 to 190 days. The analysis also found around twice as high a risk of NR-d in the temporal range of 80 days, although there were ups and downs. Peaks were observed between 121 and 130 days and between 181 and 190 days, as well. A noteworthy fact is that the risk of NR-d was slightly higher than RV-d within 10 days after the first victimization.

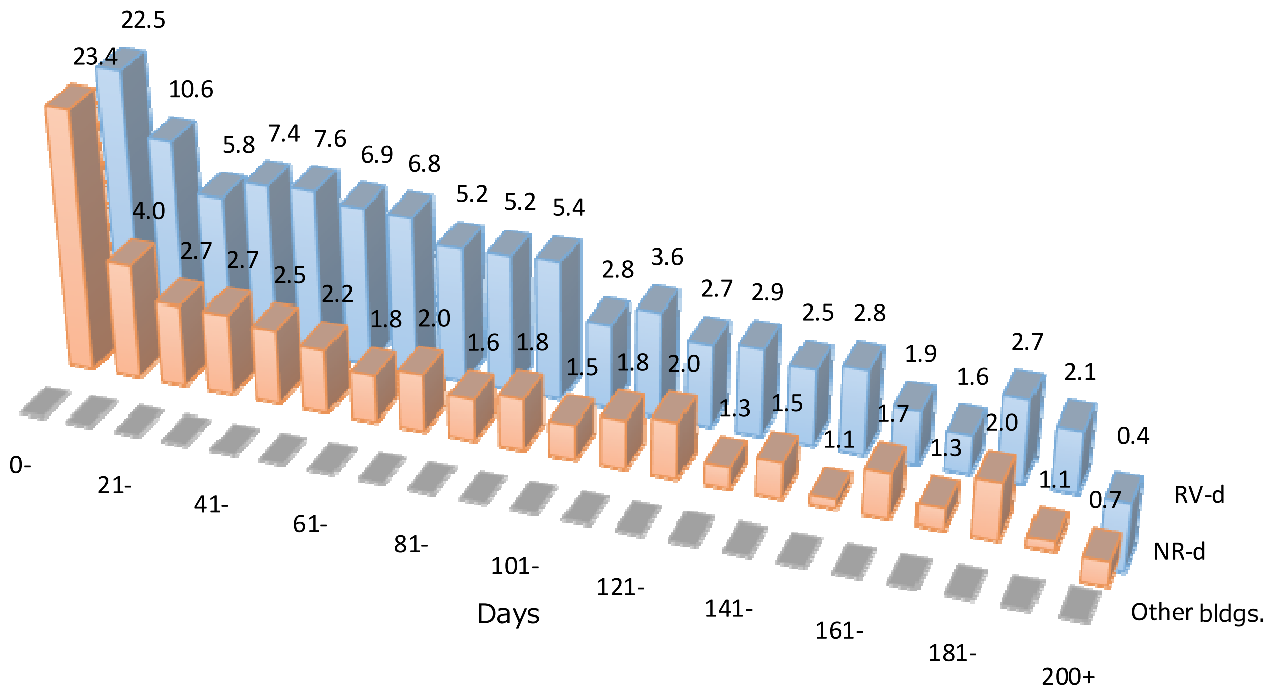

Fig. 3

Knox ratio in each spatiotemporal band (Analysis B)

Note: The data in this figure are shown in Table A.5.

4. Discussion

One of the contributions of this study is that clear RV and NR phenomena were found in multifamily housing in Japan, at both the building and dwelling-unit levels. The first research question examined whether NR of nearby buildings (NR-b) occurred after excluding victimization of other units in the same building and found that the risk of NR-b in the spatiotemporal range of 300 m and 70 days was significantly high. The Knox ratio of NR-b within 100 meters and 10 days was 4.4, which was higher than that in previous studies in N

City (Wang & Liu, 2017), Beijing (Chen et al., 2013), and Wuhan (Ye et al., 2015) in China (2.85, 1.68 and 1.55, respectively, within 100 meters and 7 days). Although the data available limit conclusiveness, this trend may be due to the difference in burglars' techniques, the reaction of the police, or the built environment of the cities. One of the reasons could be the development of the railway network in Fukuoka City. Areas with railway stations are more likely to be visited by burglars during their routine activities involving travel (Bernasco et al., 2015); especially in Fukuoka City, multifamily housing complexes are concentrated around railway stations. Therefore, burglaries in multifamily housing might be more concentrated around railway stations in Fukuoka City than in other cities.

The second research question examined whether RV of a dwelling unit (RV-d) existed and found that the risk of RV-d in 160 days was significantly high. In addition, a crime pattern was identified for the first time in which dwelling units in the same building of a victimized unit are likely to be victimized during a certain period from the time of the first victimization, termed NR-d in this work. The risk of NR-d was nearly twice as high in the temporal range of 100 days, although there were ups and downs. This crime pattern could be explained by the similarity in the internal layout of dwelling units in a building and the accompanying homogeneity of the characteristics of residents and their living patterns. Moreover, the risk of NR-d was higher than that of RV-d only within 10 days, which means that other dwelling units in the same building of the burgled unit were likely to be burgled soon after the initial burglary. Dwelling units in the same building may be burgled by the same person(s) one after another from the balcony side, where units are separated only by a thin partition for the fire escape and windows are likely to be unlocked. Thus, this study confirmed the difference in spatiotemporal patterns between RV-d and NR-d. Therefore, presenting the risk of RV and NR in multifamily housing with a new approach, which was over/underestimated in previous studies, is a remarkable contribution of this study. Future studies should analyze separating multifamily housing, including semi-detached and terraced housing, from detached housing even in cities with lower rate of households living in multifamily housing than Fukuoka City. Meanwhile, the spatiotemporal concentration of burglaries in multifamily housing would make it possible to draw up plans to prevent more burglaries with lesser efforts in fewer places and over a shorter period.

This work provides recommendations to prevent RV-d, NR-d, and NR-b, respectively, with respect to the Japanese context. Programs to prevent repeat burglary victimization need to be tailored to the specific context of the crime problem (Grove, 2011). First, regarding RV-d, this study found periodic peaks or risk up to four months after the first victimization. As burglars might wait for times when the burgled household withdraws a warning or replaces stolen goods, such as electric appliances (Ashton et al., 1998; Clarke et al., 2001; Polvi et al., 1991), timely announcement by the police would be useful. In Knowsley, Merseyside, England, swift assessment of risks and a remedy for them in burgled homes were implemented successfully (Thompson et al., 2008). Lower perceived risks by burglars and lesser efforts required of them increase the likelihood of a house being burgled (Vandeviver et al., 2015), and changes in the target as a remedy, such as installing security lighting or an alarm, are primary factors to prevent repeat burglary (Ashton et al., 1998). However, target hardening, increasing the security of a property, cannot be practiced on repeatedly burgled households by mere voluntary efforts (Hirschfield et al., 2010). Especially in the case of rental apartment buildings in Japan, tenants cannot modify their dwelling units owing to the strict duty of restoration to the original state based on the Civil Code.

Second, to prevent NR-d, a “cocoon neighborhood watch,” which urges the burgled household and its neighbors to warn against suspicious behavior, is recommended (Farrell & Pease, 2007; Forrester et al., 1988). Adding the temporal axis to this program, a continuous warning system would be useful in a building and its neighborhood for a certain period based on the spatiotemporal range proved in this study. Informing the homeowners of the houses near a burgled home of the fact that there was a burglary, inviting them to a security assessment, and offering them crime prevention advice by the police achieved satisfactory results in the UK (Chainey, 2012; Thompson et al., 2008). In Japan, however, to protect the privacy of the victimized household, the police do not inform the residents’ association (in case of owned housing) or the manager (in case of rental housing) of the occurrence of such incidents, except in cases where CCTV records are required by the police. The police should inform them of the incidents, with consideration for the privacy of the victimized household. In case the burglar breaks a window in a rental housing unit, the manager would come to know of the incident when the burgled tenant asks for repair. However, the manager will not share this information with other tenants or neighbors because such information may lower the value of the apartment building. In such a case, the manager will not have any incentive to improve the security of the apartment building because the improvement does not necessarily relate to the rental fees. Certification of crime-resistant apartment buildings, which assesses measures from the viewpoint of Crime Prevention through Environmental Design (CPTED) concepts and relates to the house rent, would be an incentive for managers (Hino & Schneider, 2013).

Third, to prevent NR-b, information delivery by neighborhood associations, which are basic organizations in Japan that promote a sense of security and familiarity (Ruef & Kwon, 2016), is recommended. In Japan, neighborhood associations account for a majority of the crime prevention volunteer groups, which have continued to increase in response to the sharp rise in crime rates around the year 2000, reaching 48,000 in 2017 (National Police Agency, 2017). Using notice boards installed on corners and passing circular notices around the neighborhood are recommended to inform neighbors of the occurrence of incidents while considering the privacy of the victimized household, as stated above.

This study, however, has a few limitations, in that the data do not include information on whether the burgled building was owned or rented; the number of dwelling units included in the burgled building is also omitted. These bits of information can be important factors of RV-b. Future studies should examine the association between the experience of RV-b and these factors, as well as other building characteristics. Additionally, data cleaning excluded several data points without correct addresses or unit numbers. In this regard, the introduction of a systematic address validation for crime information (Townsley et al., 2000) or satellite-assisted position acquisition device would be expected to develop research on burglaries in multifamily housing, especially in high-density cities. Finally, environmental factors of neighborhoods that classify single and RV/NR burglaries should also be incorporated into the examination, as in previous studies (Moreto et al., 2014; Nobles et al., 2016), and these should be based on research examining the relationship between domestic burglary incidents and the built-environment and socioeconomic factors of the neighborhoods in Japanese cities (Amemiya, 2013; Hino & Kojima, 2007; Uesugi & Hino, 2015). It might be the uniqueness of multifamily housing complexes in Fukuoka City, in that they are concentrated around railway stations, and people with varied income levels, from students to the wealthy, live there. The findings in this study have to be examined in other cities with different physical and social environments for generalization.

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Appendices

Table A.1

Characteristics of victimized households

Household composition	One-person	5,772	65%
	Couple	581	7%
	Other family	2,453	28%
	Company	39	0%
Sex	Male	5,501	62%
	Female	3,344	38%
Age	Teens	574	6%
	Twenties	3,974	45%
	Thirties	1,996	23%
	Forties	1,022	12%
	Fifties	636	7%
	Sixties	380	4%
	Seventy or older	263	3%
Floor	First	4,302	49%
	Second	1,131	13%
	Third	526	6%
	4-6	799	9%
	7-10	291	3%
	≥11	33	0%
	Unknown	1,763	20%
Total		8,845	100%

Table A.2

Victim rate per 1,000 households by household composition and floor number

		Victimized households (a)	Households in the city (b)	Victim rate (c)
Household composition	One-person	5,772	295,694	19.5
	Couple	581	63,889	9.1
	Other family	2,492	166,818	14.9
Floor	≤3rd floor	5,237	133,756	39.2
	≥4th floor	3,608	392,644	9.2
Total		8,845	526,401	16.8

Table A.3

Distribution of the possible time intervals of burglary

Interval	Num. of burglaries	
0–1 (hours)	397	4.5%
1–3	525	5.9%
3–6	1,007	11.4%
6–9	1,054	11.9%
9–12	1,211	13.7%
12–15	915	10.3%
15–18	376	4.3%
18–24	319	3.6%
1–2 (days)	620	7.0%
2–3	411	4.6%
3–4	260	2.9%
4–5	203	2.3%
6–10	464	5.2%
10–20	276	3.1%
20–30	162	1.8%
30+	402	4.5%
Unknown	243	2.7%
Total	8,845	100.0%

Table A.4

Knox ratio in each spatiotemporal band (Analysis A)

(days)	RV-b	1(m)–100	101–200	201–300	301–400	401–500	501–600	601–700	701–800	801–900	901–1000	1000 +
0–10	23.6**	4.4**	2.3**	1.9**	1.7**	1.4**	1.3**	1.2**	1.2**	1.3**	1.1**	1.0
11–20	4.2**	1.7**	1.2**	1.1	1.1	1.1	1.0	1.1	1.1	1.2**	1.1	1.0
21–30	2.6**	1.4**	1.3**	1.2*	1.0	1.1	0.9	1.0	1.0	1.0	1.1	1.0
31–40	2.9**	1.3*	1.3**	1.1	1.2**	1.0	1.0	1.0	1.1	1.1	1.1	1.0
41–50	2.8**	1.4**	1.4**	1.4**	1.1	1.2**	1.1*	1.0	1.2**	1.0	1.1	1.0
51–60	2.2**	1.5**	1.2	1.1	1.0	1.0	1.1*	1.0	1.1	1.1**	1.0	1.0
61–70	2.6**	1.5**	1.1	1.2**	1.1	1.1	1.2*	1.1*	1.1*	1.0	1.0	1.0
71–80	2.2**	1.4*	1.3**	1.0	1.1	1.1*	1.1	1.0	1.1	1.0	1.0	1.0
81–90	2.0**	1.3*	1.2*	1.2*	1.0	1.1	1.1	0.9	1.0	1.0	1.0	1.0
91–100	2.3**	1.5**	1.1	1.0	1.1	1.1	1.0	1.0	1.1**	1.0	1.0	1.0
101–110	1.4	1.4*	1.2	1.2*	1.1	1.1	1.1	1.0	1.1*	1.0	1.1	1.0

111–120	1.6**	1.1	1.0	1.2*	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0
121–130	1.7**	1.3	1.1	1.0	1.2*	1.1	1.1	1.1	1.0	1.1	1.1*	1.0
131–140	1.6**	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.0
141–150	1.4	1.1	1.1	1.1	1.1*	1.2*	1.1	1.2*	1.0	1.0	1.0	1.0
151–160	1.5*	1.1	1.2*	1.1	1.0	1.0	1.0	0.9	1.1	0.9	1.0	1.0
161–170	1.5	0.9	1.0	0.9	0.9	1.0	1.1	1.0	1.0	1.0	1.0	1.0
171–180	1.4	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.1	1.0
181–190	1.7**	1.4**	1.0	1.0	1.1	1.0	1.0	0.9	1.0	1.0	1.1*	1.0
191–200	1.2	0.9	1.0	1.0	1.0	1.1	1.0	1.0	1.1	1.0	1.1	1.0
200+	0.7	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0**

Note: RV-b: repeat victimization of a building. ** $p = .001$, * $p < .01$.

Table A.5

Knox ratio in each spatiotemporal band (Analysis B)

(days)	RV-d	NR-d	Other buildings
0–10	22.5**	23.4**	1.0
11–20	10.6**	4.0**	1.0
21–30	5.8**	2.7**	1.0
31–40	7.4**	2.7**	1.0
41–50	7.6**	2.5**	1.0
51–60	6.9**	2.2**	1.0
61–70	6.8**	1.8*	1.0
71–80	5.2**	2.0**	1.0
81–90	5.2**	1.6*	1.0
91–100	5.4**	1.8**	1.0
101–110	2.8**	1.5	1.0
111–120	3.6**	1.8*	1.0
121–130	2.7*	2.0**	1.0
131–140	2.9*	1.3	1.0
141–150	2.5*	1.5	1.0
151–160	2.8*	1.1	1.0
161–170	1.9	1.7*	1.0
171–180	1.6	1.3	1.0
181–190	2.7**	2.0**	1.0
191–200	2.1	1.1	1.0
200+	0.4	0.7	1.0**

Note: RV-d: repeat victimization of a dwelling unit, NR-d: near repeat in the same building.

** $p = .001$, * $p < .01$.