A spatial analysis of the relationship between socio-demographic characteristics with burglar behaviours on burglary crime

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Abstract. In recent years, the criminal and violent behaviour has become a national crisis in Asia and many pieces of research have been implemented to determine the criminal phenomena and the pattern of a crime occurred. Among the occurrences of crime incidence, the burglary crime was the most regular type of crime that commonly occurred in the urban area after the motor vehicles theft in Malaysia. Normally, the crime incidences were affected by several coinciding variables such as the offender's behaviour and motivation, the physical environment factor and the victim's behaviour. Overall, there are seven fundamental socio-demographic variables were determined and applied to investigate the pattern and motivation of burglar commit a crime incidence. The results showed that the burglary crime incidences were affected by the socio-demographic variable and burglar behaviour by using the spatial analysis method.

1. Introduction

Recently, criminal conduct is specifically defined as violence and anti-social behaviour, which has been deliberated as the most significant social concern in their daily lives. In accordance with the Whites survey (2017), every person will be exposed to at least one criminal activity in their lifetime. In 2015, nearly 10 million people were affected by the crime. [1]. In fact, particularly one of the victims in ten crimes was a child. Generally, burglary is defined as the act of entering a building or house illegally to perpetrate stealing, hurting someone or accomplish unlawful harm. It may appear or occur in various ways and types of property, whether it is residential or commercial/retail premises. [2]. According to common law, Sir Matthew Hale defined burglary as the act of breaking into a vacant house or building by others at night in order to commit a felony [3].

Generally, the Crime and Safety Report in (2016) shows that Malaysia is listed as a crime index (65.56) higher than Vietnam (53.45), followed by Cambodia (52.72) and Indonesia (52.16) [4]. Besides that, as stated by the Crime Statistics of Malaysia, the significant types of criminal behavior that usually arose are the burglary crime emulate other types of crime incidence. [5]. Basically, the occurrence of burglary incidences is also affected by various variables, such as the design and structure of the property (houses, apartments, condominiums, and public housing), the accessibility of the property, security, and burglar behaviour (opportunism and intention).

Basically, the victim's household characteristics will be the most important factor affecting the burglar decision when committing a crime [6-8]. For example, family vulnerabilities, such as accessibility, security level, living conditions, and family visibility, will affect the burglar's crime decision or target. Previously, some researchers found that the risk of a residential burglary in Leeds, UK, was affected by four significant community factors, such as social type, occupancy rate, attractiveness, and cooperation efficiency [9].

According to Chang (2011) research, the target location or victim of the burglar is also affected by the victim's demographic behaviour like their age, family dimension, length of residence, and victimization experience of the local householder [10]. Previously, several studies have found that most offenders or thieves are from youth groups (16 to 24 years old) and they may be probably three times more probably to perpetrate crimes compare to others [11-14]. In addition, some researchers have determined that the incidence of residential theft is also affected by personal characteristics such as race and gender. For example, Inbaraj (2010) determined that the majority of the Malaysian population is Chinese and Malay. Although the Indians stated that they were a minority group in Malaysia, most criminals were still from Indians [15].

In this study, the relation among socio-demographic factors with burglar behaviours with the prevalence of occurrence burglary phenomena in Mukim Seputeh is investigated. Thence, this study determined and analyzed the impact and influence of social demographic factors on Mukim Seputeh burglary incidence.

2. Study Area

The focus of research area is Mukim Seputeh, which is the main district and parliamentary constituency of Kuala Lumpur, Malaysia, adjacent to Brickfields (Figure 1). In addition, Mukim Seputeh is also well-known as the most central region, which is just nearby to Petaling Jaya, Cheras, and Bangsar. In addition, Mukim Seputeh contain 95 of Taman, including 389,492 residents. In essence, Seputeh's development is mainly allocated to housing and apartment development. Although Seputeh has many ancient housing areas, however, many new developments were launched in the residential area and more facilities, utilities, and infrastructure are provided for society.

3. Methodology

In order for achieving all research aim and objective, the research methods play the most significant part of this study. Therefore, there are three principal stages are implemented in order to achieve the research purpose, such as preliminary research, acquisition, and preparing the data followed by analysing the data. In this study, ArcGIS 10.4 software was used as a tool to identify, classify, and analyse the occurrence of a burglary in space and time. The following section provides the details of the proposed methodology.

3.1. Preliminary Study

In Phase 1, the determination of the research aim and objectives, research questions, research scope, datasets, software and hardware, literature review, database design and development, and lastly the estimated research results will be conducted in the preliminary study stages
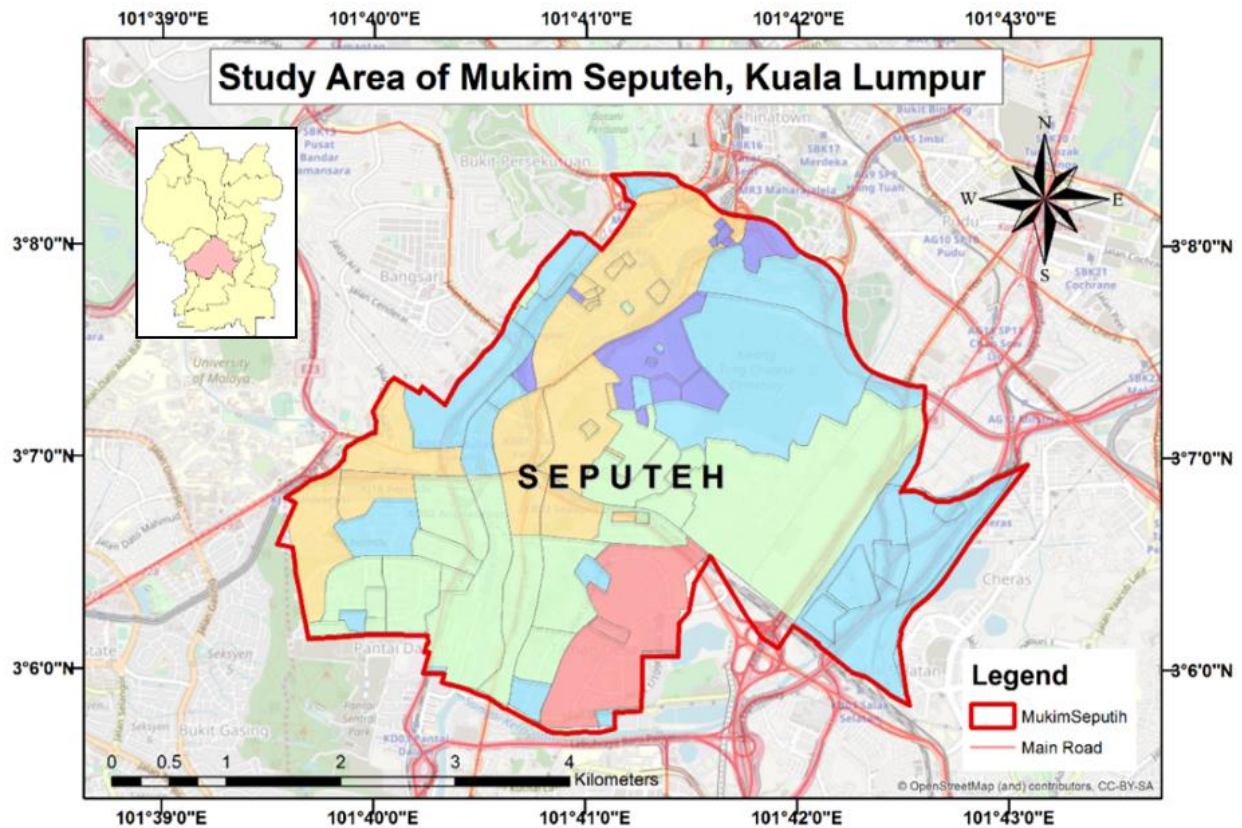
Figure 1. The study area in Mukim Seputeh, Kuala Lumpur, Malaysia.

3.2. Data Preparation

There are three principal part will be concerned in these phases, for instance, the acquisition of data, preprocessing dataset, designing and developing the database. The following sections provide detailed information about these tasks.

3.2.1. Data Acquisition.

Besides that, the obtaining of Mukim Seputeh 's spatial-temporal data process will be conducted in these phases. These data were obtained from different data providers where, for example, Malaysian Centre for Geospatial Data Infrastructure (MaCGDI), Dewan Bandaraya Kuala Lumpur (DBKL), Sistem Pemantauan Bandar Selamat (SPBS), OpenStreetMap (OSM) and Department of Statistics Malaysia (DOSM).

Essentially, the data that associated with criminal behavior was provided by the SPBS and DBKL with a permission from the Polis DiRaja Malaysia (PDRM) and Institut Sosial Malaysia (ISM). The criminal data from the year 2011 until the year 2016 were provided and received from the Property Crime Index. Basically, SPBS and DBKL provide crime data with permission from Polis DiRaja Malaysia (PDRM) and Institut Sosial Malaysia (ISM). The received crime data set is based on the Property Crime Index, which records crime incidents from 2011 to 2016. In general, the spatial-temporal information of existing crime incidents was provided, such as the location, date, time, and loss amount.

In addition, DBKL and OSM provide some attributes for road network data, such as road type, road name, direction attribute, etc. In addition, MaCGDI, DBKL and DOSM also provide data such as building and socioeconomic data. Therefore, the relation among the physical environment (such as land use and demarcation data) with burglar can be determined and analyzed in this study with the provided data from MaCGDI.

3.2.2.   Data Pre-processing. In this part, the topology, coordinate system and the attributes of all datasets are verified and checked to ensure the accuracy and applicability for further analysis. For instance, the accuracy of positioning of all spatial datasets has been standardized by using the projected coordinate system defined as the Rectified Skew Orthomorphic (RS0) Kertau Malaya (meter). Besides that, the pre-processing process also has been carried out to make sure that the analysis progress can be carried out successfully and properly. The workflow for the preparing data process was shown in Figure 2.
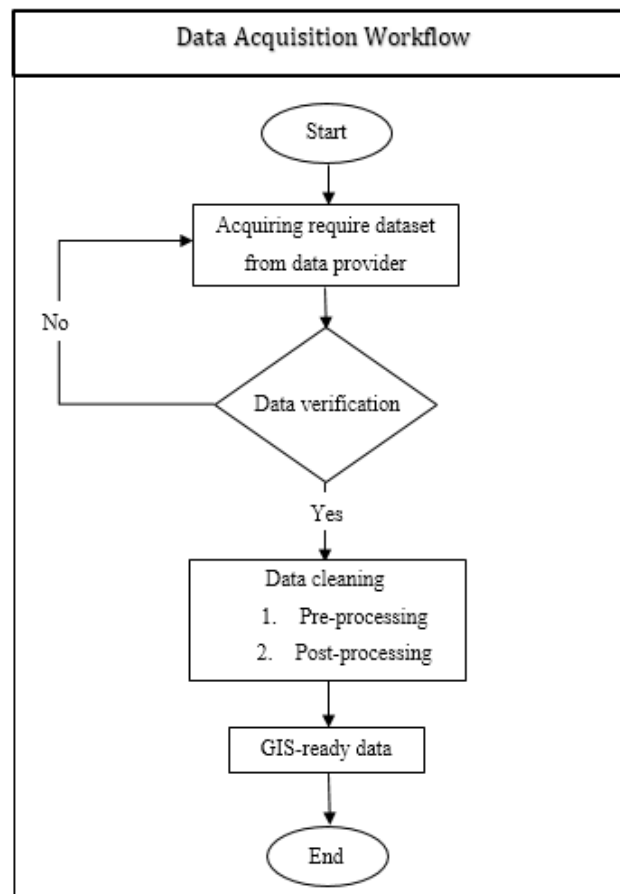

Figure 2. The workflow for validation and clean-up of data collection.

Then, the original data set is undergoing a dataset clean-up process. The cleaning process includes the phases of checking topological data to eliminate errors, data inconsistencies, coordinate system verification, map projection, update the attribute data, and feature datasets classification (recognition of boundary areas, roads, transportation networks, and identification of buildings from the original dataset).

In addition, the verification and classification of the burglary variables have proceeded in order to import to the database. Consequently, the calculation and classification of the socio-demographic variables like level of safety, age bracket, level of education, density level of immigration, density level of the elderly population, and a density level of ethics have proceeded in this study. Ordinarily, these variables are differentiated into different categories or levels. Generally, the level of every factor is obtained by dividing the number of every factor by the overall inhabitants of every Taman. For instance, the education level is computed by dividing the number of highly educated residents by the overall amount of inhabitants in every Taman. Table 1 defines the classification level of each social demographic variable.

Table 1. The classification level of each social demographic variable.

Variable	Density Level	Explanation
Security Level	1-2	Low Security Level
	3-4	Medium Low Security Level
	5-6	Medium Security Level
	7-8	Medium High Security Level
	9-10	High Security Level
Education Level	1	Low Education Level
	2	Medium Low Education Level
	3	Medium Education Level
	4	Medium High Education Level
	5	High Education Level
Working Class	1	Low Working Class Level
	2	Medium Low Working Class Level
	3	Medium Working Class Level
	4	Medium High Working Class Level
	5	High Working Class Level
Immigrant Level	1	Low Immigrant Level
	2	Medium Low Immigrant Level
	3	Medium Immigrant Level
	4	Medium High Immigrant Level
	5	High Immigrant Level
Old Resident Level	1	Low Old Resident Level
	2	Medium Low Old Resident Level
	3	Medium Old Resident Level
	4	Medium High Old Resident Level
	5	High Old Resident Level
Races Level (Indian Density)	1	Low Indian Density Level
	2	Medium Low Indian Density Level
	3	Medium Indian Density Level
	4	Medium High Indian Density Level
	5	High Indian Density Level

   3.2.3. Database Design and Development. There are three types of the database were design and developed in this study, such as physical model, logical and the last but not least conceptual models. Typically, the database will be exploited as a reference in the analysis stage, the stage may be used to determine the properties and analysis of the dataset entity.

4. Results and Discussion
In this study, the kernel density method in ArcGIS 10.4 was also used to define and resolve the impact of sociodemographic characteristics and burglar conduct on the larceny incidence. Besides that, the density of burglary incidents in different Taman regions also has been determined by applying the tools of Kernel Density. Furthermore, the process determination, identification, classification, and analysis of socio-demographic variables that affecting the density of the burglary crime also proceeded in this study. For instance, the socio-demographic factor that influences the occurrence of burglary phenomenon were building type, level of education, level of security, India factors, age group, and the old immigrant population density factor.

4.1. Building Types
As stated by Rengert's (2018) research, the types of building in the surrounding residential area were affected the deciding of the burglar before committing an offense especially a target building or victim

[6-8, 16]. For example, compared to an apartment or condominium with high-security personnel patrolling, burglars prefer to break into insecure semi-detached and detached houses. There have several types of buildings in the area of Mukim Seputeh. Figure 3 depicts a list of types of buildings with a high incidence of burglary from 2011 to 2015.
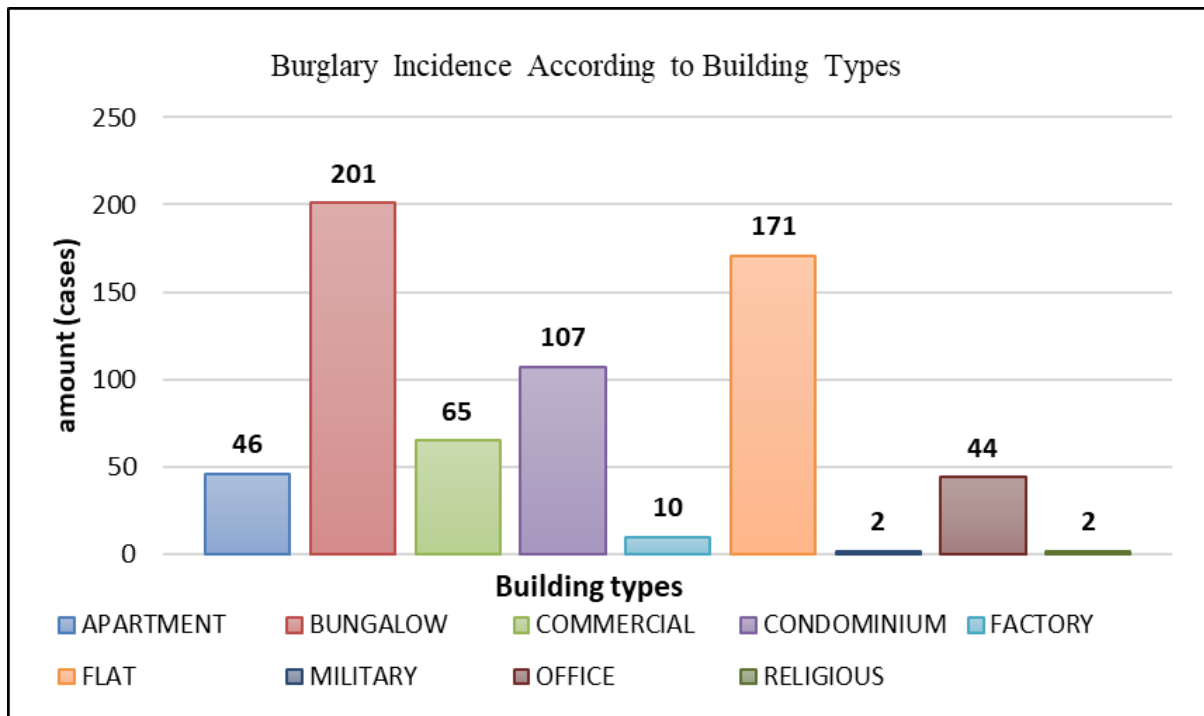

Figure 3. The amount of occurrence of burglary correspond to the building types.

As shown in Figure 3, compared with other types of buildings, the residents that living in bungalows, apartments and condominiums have higher probability been burglary's victims. In addition, the fundamental factors that influence of the burglar deciding after selecting the building type are the reachable housing location, the accessibility of the escape path, and the victim's housing relative wealth scale. Previously, several studies have shown that due to the burglar's ability, accessibility, and visibility, they prefer to break into corner houses rather than row houses. In addition, the houses or buildings with better traffic networks such as road networks will provide more opportunities for the burglar to break through, steal or escape [5-7, 9].

4.2. Security Level
Ordinarily, the evidence of dogs, alarms, locks amount, and the fence types of the building can be used to determine the physical security of certain houses or buildings (Moretto, 2010). In former days, several pieces of research established that dogs are the among most significant element that affects the success of admissions [17].

In Mukim Seputeh, the building or residential areas that with lower security level was attracting most of the housebreaker to perpetrate an offense as shown in Figure 4. The classification of security levels is shown in Table 1 in Table 3.2.2. The target of the burglar was concentrated on those less secure house or the building that located far exceed from the police headquarters. For instance, as shown in Figure 4, the burglar's targets or choices centralized in the insecure residential areas, such as semi-detached and detached houses compared with the highly secure apartments.
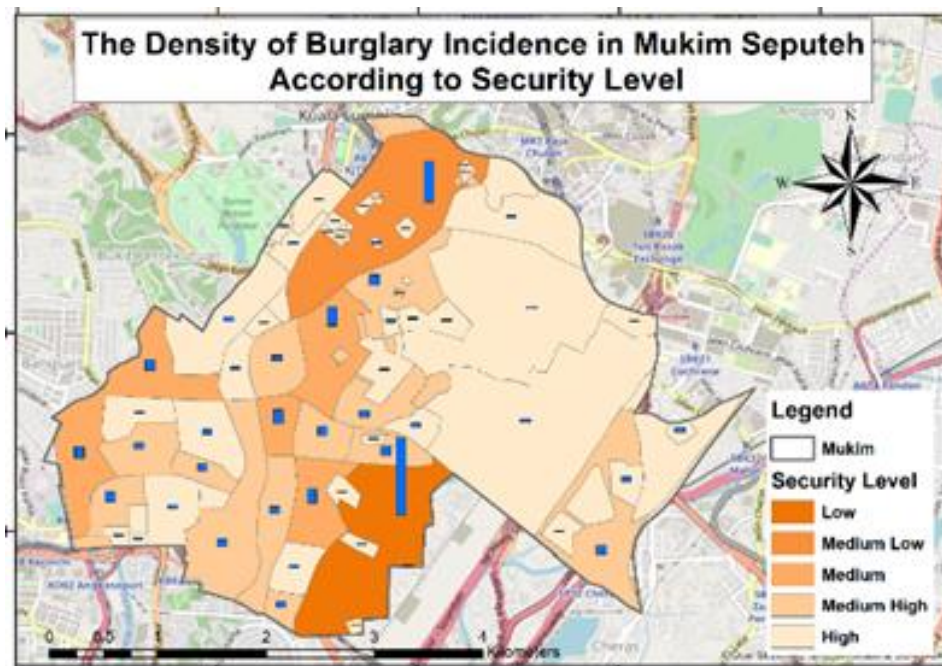
Figure 4. The density of occurrence of burglary correspond to security level.

4.3. Education level

In addition, the incidence of burglary crime influenced by the education level of the residents in Mukim Seputeh. Essentially, residents with higher education come from high-income people. Consequently, the wealthy status and financial resources of highly educated victims will fascinate criminals and thieves. As stated by Mawby's (2014) research, the burglar more probably to select the target or victim that was higher education compared to the residents with lower education levels [6, 18-19]. The relation among the education level of residents with the occurrence of burglary is shown in Figure 5.
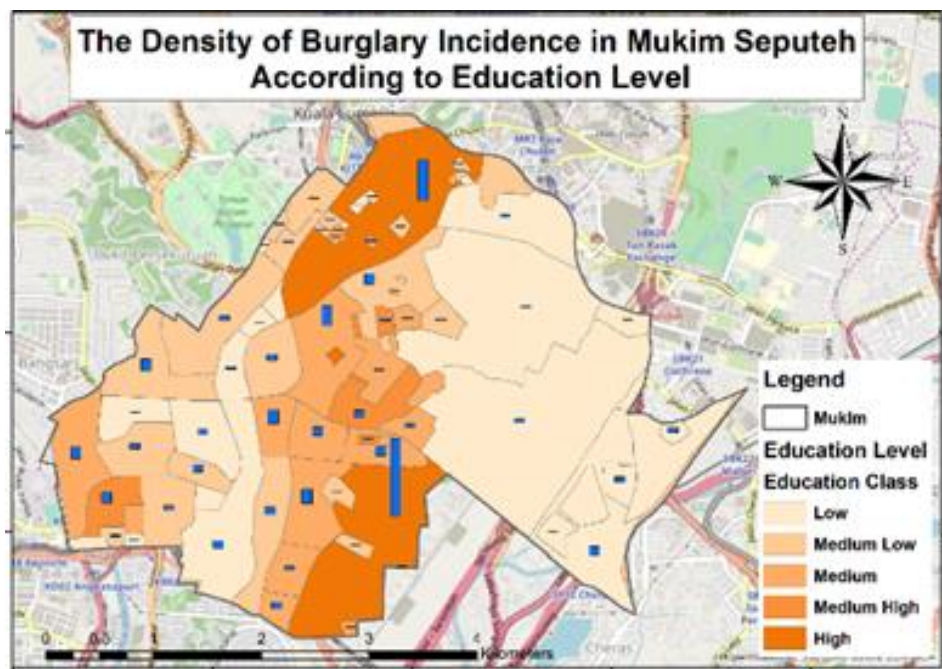

Figure 5. The density of occurrence of burglary correspond to education level.

4.4. Race Factors

Additionally, the occurrence of burglary crime in Mukim Seputeh also influenced by race factors (such as Indian factors). In Malaysia, most of the offenders for property crimes like burglary incidence and vehicle thief are from Indian citizens. Recently, most of them live in densely populated low-cost apartments and categorized as low-income groups. Thence, in order to bear the expense of their housing facilities cost and living costs, they have been forced to perpetrate an offense [20-21]. Therefore, as shown in Figure 6, areas with a higher population density of Indian citizens are more likely to be targets or victims of burglary.
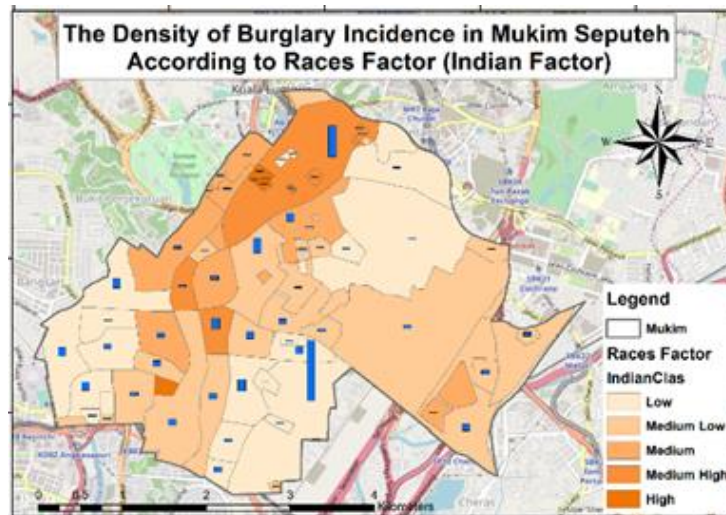

Figure 6. The density of occurrence of burglary correspond to race factor.

4.5. Working Class Factors

Moreover, the possibility of burglary incidence arose in the residential region also influenced by the factor of working group density. Generally, the age of the working group residents is between 20 to 49 years old. When the victim's house in the working group is not occupied or empty, the housebreaker would break in the selected building to commit a crime. Therefore, the burglary incident victim and the targeted building would be centralized on the working group residents. The relationship between the density of the working group and the rate of burglary incidents has also been shown in Figure 7.
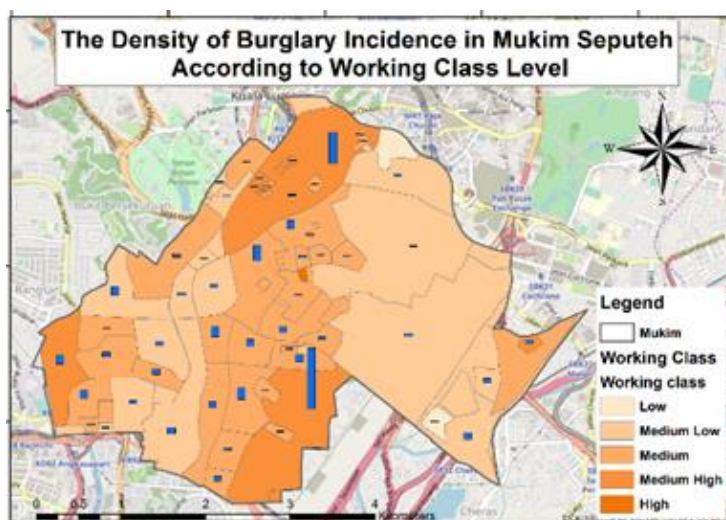

Figure 7. The density of occurrence of burglary correspond to working class level.

4.6. Immigrant Factors

In addition, the incidence of burglary crime also affected by the immigration factors. Malaysia has a high international immigration rate compare to other Southeast Asia countries. In Malaysia, in order to solve the labour shortage problem in the economic sector, large number of low-skilled workers or low-paid labour will be fascinated. For instance, the labour shortage problem for the construction sector has been solved by importing Bangladesh labourers and paid at low wages. Therefore, in sequence to obtain additional economic sources and essentials to afford their living costs and housing facilities, many immigrants will be forced to commit property crimes. Thence, the relation between the density of immigrants with the probability of burglary incidents perpetrated was shown in Figure 8.
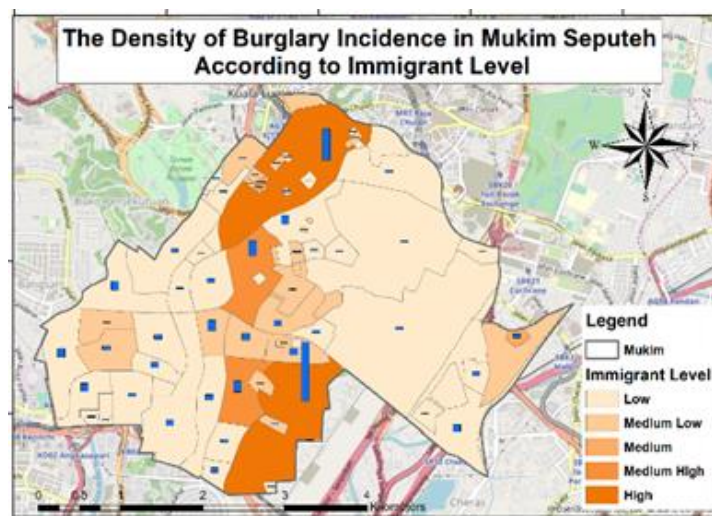

Figure 8. The density of occurrence of burglary correspond to immigrant level.

4.7. Old Resident Factors

Finally, the pattern or decision-making of burglar is also affected by the factors of old residents. Usually, the old residents or citizens that aged more than 55 years more likely live in the apartments and terrace houses. In addition to this, the elder resident that lack of awareness and higher building approachability will make them highly targeted as the victims when property crimes occur. Therefore, the relationship between the density of elder residents and the incidence of burglary is shown in Figure 9.
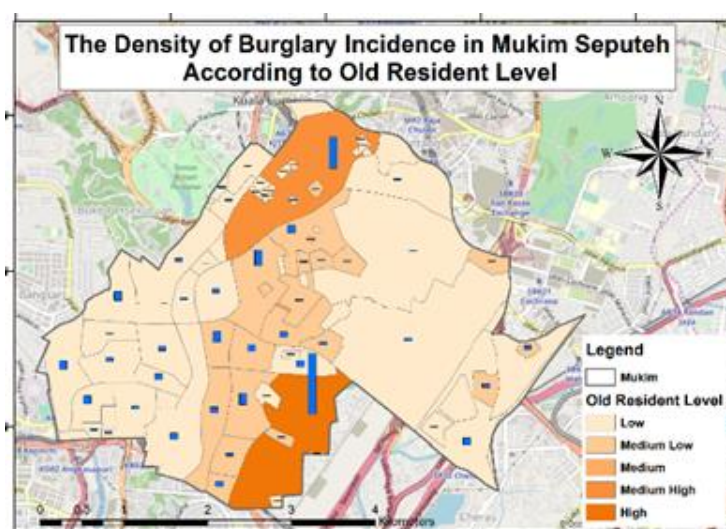

Figure 9. The density of occurrence of burglary correspond to elder resident level.

5. Conclusion

According to the research of Wortley R and Townsley M (2016), crime analysis defined as an outstanding professional process that analyses the data by using the qualitative and quantitative methods [8, 12]. The results of the analysis will be beneficial to police agencies and local authorities in order to reduce and control the criminal behaviour occurred in the residential area. For instance, police agencies can utilize the results in order to investigate and prosecute criminal behaviour, patrolling, and evaluation of police work. Moreover, the local authorities and agencies can adopt the crime analysis result to have better problem-solving and decision making in order to reduce and prevent criminal behaviour occurred unexpectedly.

Overall, the relation among socio-demographic variables with burglar conduct has been committed and analyzed in this study. Therefore, the results indicate that the occurrence of burglary is influenced by several significant spatial-environmental factors such as low-security level, easy access to the property, types of building, and burglar behaviour (opportunism and burglar motives).

However, the ability to simulate burglar conducts and action or motives in this study is limited. Therefore, in order to imitate the phenomenon of criminal behaviour and the motive behind it spatially or temporally, different computational modelling methods should be distinguished in the criminology fields. In the past, many pieces of research founded that Agent-based modelling (ABM) is the among most representatives modelling methods to simulate the interaction of the autonomous entities in their environment. Therefore, the ability and availability of the ABM model in order to simulate different criminal theories and reduction policies has been selected to simulate the complexity of criminal phenomena [9, 22-26]. Thence, the ABM model has been recommended as the results of the abilities and functionalities to simulate the relationships between burglar behaviour and social physical environmental variables in the time ahead.

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