Examining Factors Contributing to Crime Occurrence in Urban Areas, Korea

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Abstract

The frequency of criminal offenses has been on the rise, and incidence of criminal offenses in urban areas such as Seoul, Busan and Incheon increased over the past decade. Violent crimes among criminal offenses have increased 43.5% in the last 10 years in Korea. This study examined factors that socially affect the occurrence of crime to reduce the crime in the cities. The study analyzed crime data of 74 local communities in terms of socio-demographic, spatial, economic and environmental factors. The study employed crime data of 2015 to 2017 using statistical analysis. The result of the study will contribute to making appropriate plans to reduce crime occurrence in Korea.

Keywords: Crime occurrence, Urban Areas, Socio-demographic factor, Urban spatial structure

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Introduction

Criminologist have long been offered numerous hypotheses to determine the cause of the crime and conducted various research to verify crime occurrence. The term criminology was first used in 1885 when the book "Criminologia" was published (Garofalo, 1885). Criminology is field that studies the occurrence, cause and measure of crime, and is an academic field that approaches from various disciplines such as sociology, psychology and economics (Shin et al, 2012). Crimes that represent the criminal patterns of society or the whole nation are called index crime. Since crime is a relative and multi-ethnic concept defined differently by the times and countries, the types of crime defined as crimes vary from country to country and within the same country to era (Lee et al, 2015; Baek, 2017). However, when it comes to serious types of crimes such as homicide, sexual assault and robbery, most countries categorize them as index crime (Kim et al, 2014). Some criminologists present a general model that can be applied to all crimes without considering crimes by type when they form theories to explain crime occurrence (Gottfredson and Hirschi, 1990; Wikstrom, 2014). Other criminologists argue that criminology is scientific study of crime (Bartollas, 1989; Wolfgang, 2002). They have attempted to bring more scientific and objective methods to the study of criminal. Studies have been conducted on a variety of variables that can explain the causes of crime. The cause of crime occurrence can be classified into those found in the micro-perspective of family, friends and neighbors, and those identified in relation to the economic or political structure of society, which is a macro-perspective (Visser et al, 2013). Even important variables that effect crime can vary in their statistical significance, orientation, and strength of the relationship, depending on the type of crime. Therefore, it is important to identify the characteristics of the variables that are differentiated by crime (Choi and Park, 2018).

Crime occurrence tend to be higher in large cities than in rural or small urban areas (Glaser and Sacerdote, 1999). The scale of city is strong predicators of fear of crime (Clemente and Kleiman, 1977) and generally the bigger the scale of city the higher the population density. The crime occurrence and population density seem to be closely related because high density offers opportunities for crimes (Harries, 2006). A dense area will have a much larger stream of potential victims than an empty area and returns from this crime should be higher in urban areas. In order to solve the problem of violent crimes in cities, the government or local governments explored alternatives measures, including the installation of CCTVs for prevention of crimes, as well as the expansion of security personnel and further application of crime prevention strategies such as CPTED(Crime Prevention Through Environmental Design). In addition, to enhance the effectiveness of crime prevention efforts, it is important that alternative measures currently taken by government or local governments are allocated efficiently to meet local demand. Although it has been common to prevent crime solely based on cumulative crime data in the area, recently an integrated study has been conducted on factors affecting the occurrence of crime rather than just a crime. Violent crime occurrence tends to increase in Korea and the types and methods of crime are also becoming more diverse. Therefore, the purpose of this research is to derive an evaluation index that includes socio-demographic, spatial, economic and environmental factors, which are known to affect the occurrence of crimes in urban areas, and to analyze the crime characteristics and major crime impact factors in the area at the district level using GIS and suggest them to reduce crimes based on these results.

Literature Review

According to the Supreme Prosecutors' Office (2018), the annual trend in total crime occurrence was the lowest in 2017 with a general tendency to decline in Korea. Homicide and robbery tend to decrease, but sexual assault has been on a constant rise since 2008 over the past decade and has decreased slightly in 2016 before increasing again to record the highest in 2017. The tendency to rise in violent crime can

be attributed mainly to the relatively high proportion of sexual assault. The sharp increase in sexual assault is attributed to an increase in the use of cameras by the widespread use of electronic devices and an increase in the indecent act by force. Although the number of homicide and robbery has been decreasing, the occurrence of violent crimes has increased by 43.5% over the past decade, and the trend of violent crimes by year has generally increased. Also, Figure 1 shows the types of crime occurrence in urban areas, Korea.
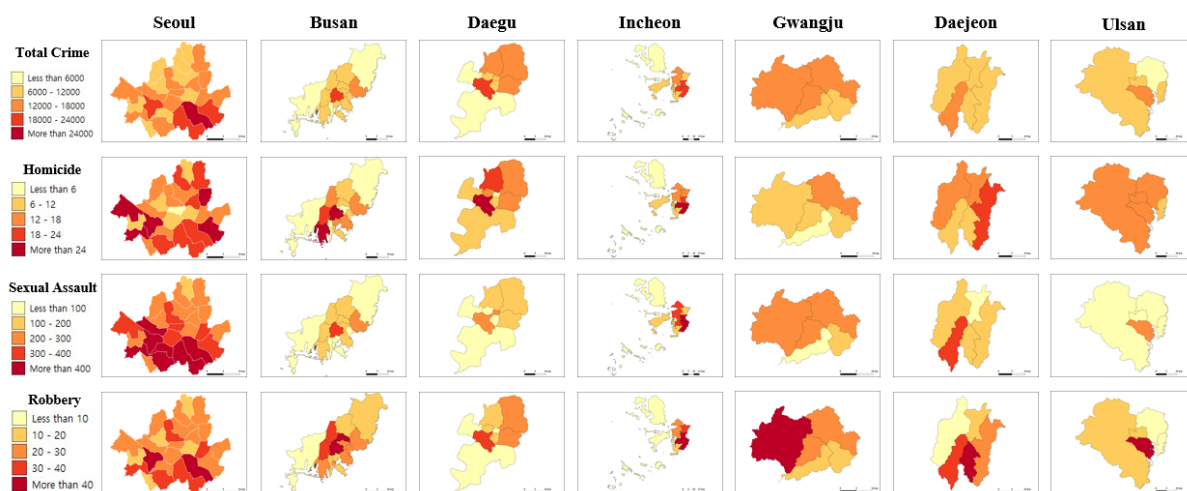

Figure 1. Crime Occurrence in Urban Areas, Korea

Table 1. Number of Crimes committed in 10 years, The Supreme Prosecutors' Office (2018)

Year	Total Crimes	Violent Crimes	Homicide	Robbery	Sexual Assault	Details of Sexual Assault	
						Rape	Indecent act by force
2008	2,189,452	24,023	1,120	4,828	16,129	3,621	6,080
2009	2,168,185	27,014	1,390	6,381	17,377	3,923	6,178
2010	1,917,300	28,134	1,262	4,402	20,584	4,384	7,314
2011	1,902,720	29,382	1,221	4,021	22,168	4,425	8,535
2012	1,934,410	28,895	1,022	2,626	23,365	4,349	10,949
2013	1,996,389	33,780	959	2,001	29,090	5,359	13,236
2014	1,933,835	34,126	938	1,618	29,863	5,092	12,849
2015	2,020,731	35,139	958	1,472	31,063	5,274	13,266
2016	2,008,290	32,963	948	1,181	29,357	5,412	14,339
2017	1,824,876	36,030	858	990	32,824	5,555	15,981

As the increase in crime is a major factor causing personal damage and hindering social development, attention to crime is being dealt with in a variety of disciplines, in addition to criminology. In the past, crime has been mainly explored on the focus of individual criminal, but more recently, efforts have been made to explain crime from a more macro-perspective such as society and the economy (Kim and Lee, 2011). Studies of existing crime occurrence have chosen target areas as national scale, region, or cities. In addition, studies of the impact of local characteristics on crime occurrence have drawn evaluation indexes from socio-demographic, spatial, economic and environmental factors, and analysis methods were utilized such as regression analysis, descriptive approach and meta-analysis. Based on the results

of the preceding study, the variables that affect the crime occurrence are as follow in Table 2.

Table 2. Variables that affect the crime occurrence

Authors	Variables
Jang (2018)	population density, female population ratio, foreigners ratio, number of CPTED projects, divorce rate, number of security facilities, local taxes
Kim et al. (2014)	population density, female population ratio, administration area, teenager ratio, foreigner household ratio, distance of nearest police station, number of general bars, number of convenience store
Lee & Kang (2015)	fluid population density, social assistant recipients ratio, foreigners ratio, percentage of female vulnerable in violent crimes, one person household ratio, official land price
Choi & Park (2018)	environmental(time, temperature, amount of precipitation, wind speed, season), Socio-environmental(social assistant recipients ratio, foreigners ratio, population density, detached-dwelling ratio, one person household ratio)
Choi et al. (2015)	absolute poverty(social assistant recipients ratio), non-economic population, unemployment ratio, GRDP, GINI coefficient, population, foreigners ratio, police population
Kim & Lee (2011)	socio-economic(population, divorce rate, teenager ratio, highly educated population ratio, social assistant recipients ratio, Local taxes, police population), spatial(residential area, mixed-use area, security facility, minimum travel time by region)
Cheong & Park (2010)	economic disadvantage(car retention rate, college education rate, cellular equipment retention rate, the financial dependence of the local government), tenant ratio, foreigners ratio, divorce Waste, population, rate of accommodation and restaurant
Lee et al. (2015)	security(Number of CCTVs), demographic(population, foreigners, children, elders over 65, number of divorce), housing characteristics(detached-dwelling ratio, apartments), number of bars, number of car retention, spatial(residential area, commercial area, industrial area, green area)
Kim et al. (2010)	individual factors(gender, age, marriage status, unemployment, level of education, income), local-level variable(proximity, informal control, public control, residential instability)
Andresen (2006)	ethnic heterogeneity, unemployment rate, university degree, population change, single parents, social disadvantage average income, average income, rentals, population, population density, number of dwellings, young population
Lockwood (2007)	percent African-American, disadvantage index, percent renter, retail/commercial, public/institutional
Sampson et al (1997)	race/ethnicity, disadvantaged(on public assistance, unemployed), personal-level predictors(married, female, single, homeowner, black, age), neighborhood-level predictors(disadvantaged, immigrant, residential stability)
Stucky and Ottensmann (2009)	intercept, spatial lag, cell population, percent black, percent Hispanic, disadvantage index, stability index, high-density residential, commercial percent, industrial percent, water percent, park percent, major roads total length, cemetery in cell, school in cell, hospital in cell, vacant percent, residual land use percent, dispersion
Poveda (2011)	GDP per capita, education, prices, poverty, unemployment, GINI, unsatisfied basic needs, salaries real, employments per industry
Harris & Vermaak (2014)	GINI coefficient, employment rate, proportion of female headed households, age (20-39), proportion of household in rural areas, racial fractionalization index, poverty rate
Wolfe & Mennis (2012)	vegetation, poverty, educational attainment, population density
Clemente & Kleiman (1977)	population, gender, race(black, white), age, income

Crimes may depend on the individual characteristics of criminals, but they have a close association with the socio-demographic of the region. In socio-demographic characteristics, there have been many prior studies showing that the variables such as gender, age, population density, fluid population density, foreigners ratio, divorce rate, drinking rate, police population and types of households affect the crime occurrence.

The crime occurrence and population density seem to be closely related (Oliveria et al, 2017). A widespread belief among sociologists and criminologists is that high population density tends to breed crime of various types (Kvalseth, 1977). However, some studies claimed that there is no significant relationship between population density and the occurrence of violent crime (Spector, 1975). According to Quarterly Crime Trend Report by the Supreme Prosecutors' Office, violent crime accounted for the largest share of female victims. Ferraro (1995) alleged that gender is often considered having an impact twice as strong as other variables such as age or social-economics status. Also, Jang (2018) found that that the increase in female population reduces the crime occurrence, while Kim, Yu and Jung (2014) found an increase in crime rates.

Some studies have analyzed the crime distribution by age in socio-demographic groups to reveal that age and crime occurrence are not relevant (Shavit and Rattner, 1988), but others argue that age is directly related to crimes (Hirschi and Gottfredson, 1983). Lee and other researchers (2015) divided the age into children and the elderly, resulting in the conclusion that the number of children is a variable that reduces the occurrence of crime and the number of elderlies increases the occurrence of crime. Developmentally, children who are raised in conflict-ridden, coercive homes are more likely to be antisocial in their attitudes, to be delinquent as teens, and to commit crimes (Barber, 2003). Also, declining academic performance of children following their parents' divorce is largely explainable indicating that such situation may have a causal link to adolescent outcomes (Forehand, 1988). There has a significant effect on sexual assault, robbery with logit percent divorce, but has no effect on the homicide (Simpson, 1985). In addition, Jang (2018) alleged that the divorce rates are showed a positive relationship with the violent

crimes and Kim and Lee (2011) analyzed the impact of divorces on violent crimes by dividing them into Seoul and Gyeonggi Province to determine the degree of spatial cluster.

It has been widely known that the alcohol drinking can increase not only the risk of physical illness and injuries but also the risk of social problems including violent behavior and crime (Lee, 2013). Some researchers analyzed the relation of alcohol drinking and sexual assault (Chung & Lee, 2018), but there are few domestic researches on relationship between alcohol drinking and violent crime. However, there are many studies abroad that analyzed the relationship between violent crime and drinking alcohol (McClelland & Teplin, 2001; Goodman et al, 1986). Therefore, further research on the effects of alcohol on violent crimes should be conducted based on domestic data.

The deployment of police forces to local characteristics is also an important method to reduce crime occurrence. The strongest evidence of police effectiveness in reducing crime is found in the case of geographically focused police practices, such as hot-spots policing (Weisburd & Eck, 2004). Domestic research also analyzed the relationship between police and crime, such as number of police officers and the distance to the nearest police station (Kim et al, 2014; Choi et al, 2015; Kim & Lee 2011). Summarizing the results of the studies, the optimal police deployment to reduce crime should be arranged in consideration of local community and local geographical characteristics.

One of the most prominent theories in criminology, the "routine activity theory" also adopts single adult households or one-person households as a significant variable (Cohen & Felson,1979). Single person households have emerged as one of the byproducts of social change. In Korea, many studies have found a positively significant relationship between one-person household and crime occurrence (Lee & Kang, 2015; Choi & Park, 2018). As it has become a significant variable both in domestic and abroad, this research also adopted the one-person household as a variable.

Sampson (1997) alleged that the higher the number of immigrants or foreigners in the community, the more collective efficacy they lose, which could lead to an increase in violent crime. People seemingly tend to treat others who are from a different cultural background as a potential threat (Sampson, 1997). Reviewing on the preceding studies that explain the relationship between the number of foreigners and crime occurrence, the fear of crime may increase as the number of foreigners increases, but the results of most studies show that the number of foreigners is a variable that does not have a significant effect on the crime occurrence and rather it decreases the crime occurrence (Choi & Park, 2018; Cheong & Park, 2011; Lee et al, 2015; Choi et al, 2015; Gonzales, 2006).

It has been fully confirmed that the deepening of high income inequality increases social pathology (Bauman, 2013). Attempts to correlate the economic situation with crime occurrence have been going on steadily in criminology. Criminologists believed that socio-demographic and economic contexts are strongly associated with crimes in urban area (Rahim, 2016). However, various logics have been suggested about the relationship between the two, but they have miscarried to reach an agreement on the development of models and polices to reduce crime occurrence in relation to the social and structural factors that lead to the crime (Akers, 2013). Studies involving economic variables suggest that poverty has a significant relationship to sexual assault (Choi & Park, 2018), and that economic inequality is also related to an increase in the occurrence of homicide (Harris & Vermaak, 2015). Through meta-analysis on inspection of the 34 studies, the inequality is positively related to crime occurrence (Hsieh & Pugh, 1993). Also, Poveda (2011) found that variables such as social conditions measured as poverty, unsatisfied basic needs and the GINI coefficient have a direct relationship with homicide. In addition, Brush (2007) found that cross-sectional regression in United States counties exhibited a positive relationship between the GINI coefficient and crime occurrence. Although the standards for economic inequality vary from countries, most studies have analyzed that rising inequality causes an increase in crime occurrence. The theory of social disorganization argues that local characteristics and crimes have

a systematical relationship. Regional characteristics can be broadly classified into physical, economic, and population configurations, where economic is measured by variables such as the low economic status, the average rent, and the cost of house ownership. Regional characteristics, other than individual characteristics, have found an important link to criminal occurrence, and socioeconomic inequality is considered to hinder social integration, resulting in crimes (Shaw & McCay, 1942). Income inequality draws attention to aspects of relationships among classes rather than poverty itself, with relative concepts such as the difference between average income of upper and lower classes rather than absolute concepts such as GDP growth rates (Einstadter & Henry, 2006). In Korea, the concept of inequality is used to explain the relationship between economic factors and crime occurrence, and the variables number of social assistance recipients is used to explain poverty.

Research is underway to create a safe urban area on the premise that the various spatial characteristics affect the crime occurrence. The routine active theory is a representative theory explaining the crime occurrence from a sociological point of view along with the theory of social disorganization. Cohen and Felson (1979) who found this theory, pay attention to the contextual environmental in the region and its connection to crime occurrence. In other words, this theory is closely related to spatial planning factors, also studies have been steadily conducted to analyze the effects of spatial planning variables such as land uses on crime occurrence (Lockwood, 2007; McNulty & Holloway, 2000; Lee et al, 2015; Kim & Lee, 2011). Therefore, studies that include land use have centered on how particular land uses, such as bars (Roneck & Pravatiner, 1989; Lee & Kang, 2015) and number of convenience stores(Kim et al, 2014). It is suggested that different land uses create different opportunity forms for crime by affecting the mixture of motivated offenders, potential victims, and the presence or absence of capable guardians (Stucky & Ottensmann, 2009). As different land uses can create different opportunity structures for crime, this study analyzed the relationship between land-use planning and crime occurrence.

Crime in urban green spaces were recognized as potentially important effects on mental health and well-being (Maruthaveeran and Van den Bosh, 2015; Foster et al, 2014). For instance, fear of anti-social behavior, such as teenage delinquency and vandalism, resulted in people being reluctant to visit urban green spaces (Burgess et al, 1988). While there are many studies abroad that analyze the relationship between urban parks and crime (Troy & Groove, 2008; Wolfe & Mennis, 2012), there are a few progress in such studies in Korea. Most studies in Korea have more focused on how to apply CPTED to urban parks rather than trying to examine their relationship to crime (Choi et al, 2018; Kim et al, 2018). Therefore, this study examined the relationship between local urban parks and crime occurrence.

Methodology

The scope and methods of this study are as follows. Firstly, in order to derive the evaluation indexes to be used in the research, the preceding studies were reviewed and the socio-demographic, spatial, economic and environmental variable's features that affecting the crime occurrence were identified. Secondly, in order to select the analysis targets, 74 urban districts (gu), including Korea's metropolitan cities, were subject to analysis, regarding identifying data on research areas that considered the characteristics of the districts. Crime occurrence data by district were used by the Korea Supreme Prosecutor's Office between 2015 to 2017. Although it is desirable to identify characteristics dynamically from the past to the present, there were difficulties in obtaining variables considering crime data or regional characteristics. In this study, the base year of the analysis was the average for a total of three year from 2015 to 2017 and the dependent and independent variables were matched by the distributed units in the 'gu' which is known as district unit in Korea.

In addition, data acquisition was selected by comprehensively considering whether data were obtained while referring to the theory and prior studies discussed earlier in selecting variables. Dependent

variables are defined the number of crime occurrences in the district per area of district (Number of Crime Occurrence / km²). Crime is closely related to spatial characteristics, so the number of crime occurrence was standardized based on the area of the district. Independent variables consisted of socio-demographic, spatial, economic and environmental variables. Total of 24 variables were selected as independent variables, and the selected for each factor are as follows. Socio-demographic variables include Female Population Ratio, Population Density, Child Population Ratio (age from 0 to 14), Aging Population Ratio (over 65 years), Divorce Rate, Foreigners Ratio, Drinking Rate, One Person Household Ratio, Female One Person Household Ratio, Elder Household Ratio and Police Population per 1,000 people. All socio-demographic variables used average values of regional indicators provided by the KOSIS (KOrean Statistical Information Service) data from 2015 to 2017. Spatial variables include Ratio of Residential/ Commercia/ Industrial/ Green Area, Apartment Units Ratio, Detached Dwelling Ratio, Accommodation Density, Bar Density, Number of Cultural Infrastructure and Number of Convenience stores. Spatial variables used average values of regional indicators from 2015 to 2017 of KOSIS, Korea Land & House Corporation (LH) and SGIS (Statistical Geographic Information System). Economic variables include Social Assistance Recipients Ratio and Local Taxes. The former data used regional indicators from the Ministry of Health and Welfare, the latter data used regional indicators from the Ministry of Interior and Safety, and both variables used average values from 2015 to 2017. Lastly, Environmental variable includes Urban Park Area per 100,000 persons which used the regional indicators from 2015 to 2017 of KOSIS.

First, the selection of analysis target was based on 74 districts in 7 cities, and types of crime occurrence density and 24 independent variables were selected. Next, the variables were then re-selected through correlation analysis because they could cause problems with multicollinearity among the variables. Finally, between the dependent and the independent variables, standard coefficient (β) was identified whether it showed the same direction with result of correlation analysis, and finally 9 variables were selected. The following Table 3. shows the variables selected at last.

Table 3. Definitions of Variables

Independent Variable		Definition	Unit	Year	Reference
Socio-demographic	Female Population Ratio	$\dfrac{\text{Female Population}}{\text{Total Population}} \times 100$	%	2015-2017	KOSIS
	Foreigners Ratio	$\dfrac{\text{Number of Registered Foreigners}}{\text{Total Population}} \times 100$	%	2015-2017	KOSIS
	Drinking Rate	The percentage of people who have drunk more than once a month in the last year	%	2015-2017	KOSIS
	One Person Household Ratio	$\dfrac{\text{One Person Households}}{\text{Total Households}} \times 100$	%	2015-2017	KOSIS
Spatial	Residential Area	$\dfrac{\text{Residential Area}}{\text{Urban Area(excluding sea area)}} \times 100$	%	2015-2017	KOSIS, Korea Land & Housing Corporation: LH
	Commercial Area	$\dfrac{\text{Commercial Area}}{\text{Urban Area(excluding sea area)}} \times 100$	%	2015-2017	
	Green Area	$\dfrac{\text{Green Area}}{\text{Urban Area(excluding sea area)}} \times 100$	%	2015-2017	
Economical	Social Assistance Recipients Ratio	$\dfrac{\text{Social Assistance Recipients}}{\text{Total Population}} \times 100$	%	2015-2017	Ministry of Health & Welfare
Environmental	Urban Park Area per100,000 persons	$\dfrac{\text{Urban Park Area}}{\text{Total Population}} \times 100000$	km²/person	2015-2017	KOSIS

Analysis

To produce more accurate results, the analysis was conducted in the following steps. First, considering that the 24 variables selected may cause problems in the multicollinearity, variables with a Pearson correlation value of 0.7 or higher were excluded between independent variables. In order to exclude

variables with correlation of 0.7 or higher among independent variables, the most correlated were excluded first. Then, the signs of the correlation coefficient and the signs of the standard coefficient (β) values were identified whether they have identical signs through regression analysis to the remaining variables, except for those that were sequentially selected. So the final variables chosen are Female Population Ratio, Foreigners Ratio, Drinking Rate, One Person Household Ratio, Residential Area, Commercial Area, Green Area, Social Assistance Recipients Ratio and Urban Park Area per 100,000 persons.

As such, socio-demographic, spatial, economic and environmental factors were divided into 9 independent variables, and the correlation and regression analysis were conducted in 74 administrative districts (gu) of Seoul Special City and 6 Metropolitan Cities(Busan, Daegu, Incheon, Daejeon, Gwangju and Ulsan) with total crime occurrence density (Model 1), homicide density (Model 2), sexual assault density (Model 3), and robbery density (Model 4) as the dependent variables. Table 4. is the result table of 9 independent variables with regression analysis for each Model.

Table 4. Regression Analysis for Identify the Variables of the Crime Occurrence

Variables		Model 1	Model 2	Model 3	Model 4
		(β)	(β)	(β)	(β)
Socio-demographic	FPR	0.082	0.031	0.215*	0.096
	FR	0.143**	0.286**	0.254**	0.076
	DR	0.079	0.249**	0.022	0.130
	OPHR	0.117*	0.038	0.156*	0.049
Spatial	RA	0.286**	0.229	0.278**	0.094
	CA	0.465**	0.294**	0.382**	0.496**
	GA	-0.257**	-0.167	-0.122	-0.191
Economical	SARR	0.001	0.330**	-0.199*	0.127
Environmental	UPA	-0.063	-0.101	-0.050	-0.021
Statistical terms	N	74	74	74	74
	Adjusted R²	0.860	0.560	0.792	0.503
	F	50.795	11.325	31.820	9.199
	* (p<0.05), ** (p<0.01)				

Note. FPR=Female Population Ratio, FR=Foreigners Ratio, DR=Drinking Rate, RA=Residential Area, CA=Commercial Area, GA=Green Area, OPHR=One Person Household Ratio, SARR=Social Assistance Recipients Ratio, UPA=Urban Park Area per 100,000 persons

Result

In general, an adjusted R^2 value of 0.5 or higher in the regression analysis can be said to be highly explanatory, with the corresponding analysis results showing that the adjusted R^2 values are all above 0.5, confirming that the variables have a high explanatory strength. Based on the results of Table 4, all Models except Model 2 shown that the commercial area had a positive effects and was the most significant of the independent variables. This can be said to be more vulnerable to crime occurrence in areas where the proportion of commercial areas is higher. In addition, The variables that negatively (-) affect all Model were Green Area and the Urban Park Area per 100,000 persons. In addition, Social Assistance Recipients Ratio negatively (-) affect Model 3. On the other hand, the variables that

positively (+) affect all Models were the all Socio-demographic variables and Residential Area, Commercial Area. For Model 2, Social Assistance Recipients Ratio was described as the most influential variable. Furthermore, there is a difference that Social Assistance Recipients Ratio was described as having a negative (-) effect on Model 3, unlike other Models.

Conclusion

Based on the regression results, looking at the variables of all Models, the significant independent variables are the Female Population Ratio, Foreigners Ratio, Drinking Rate, One Person Household Ratio, variables of Spatial factor and Social Assistance Recipients Ratio. Next it is about the effect examination on each variable has on each Model.

The subjects vulnerable to crime are children, women and elderly, and it is obvious result that the female population ratio has positive effect on crime occurrence. In addition, it was found that sexual assault and female population ratio were significant, which is the right result considering that the most vulnerable target of sexual assault is women. Although many researchers said that the number of foreigners does not have a significant impact on the crime occurrence, this study found that the foreigners ratio has a significant effect on all Models except Model 4 and increase the number of crimes on all Models. Lee and other researchers (2015) alleged that the increasing influence of multi-cultural families can be attributed to foreigners rather than to perpetrators or perpetrators or victims of crimes. In other words, as families increase, social bonds in the region increase, reducing the risk of crim. However, as explained by Sampson (1997), the increase in foreigners in local units reduces collective efficacy, which can lead to an increase in crime occurrence.

The results show that an increase in the drinking rate increases the crime occurrence. Drinking rates also show significant results for Model 2, which can cloud judgment and lead to motiveless homicide. Also, drinking can put people in a situation where they can commit crimes more easily because they have less control over themselves.

The composition of single households in the city is mainly comprised of unmarried adult age groups, which are more likely to be exposed to crimes involving many activities at night time than those at family units due to irregular living patterns. According to Social disorganization Theory, stable family types have relatively low rates of migration and are likely to increase exchanges with local residents. It can also act as a defense mechanism against crime. In addition, the routine activity theory explains that if someone is exposed to living alone, he or she is more likely to exposed to the crime.

Spatial factors are estimated to have large impact on the crime occurrence in the order of commercial area, residential area and green area. The commercial area, which seems to have the biggest impact among the variables, could confirm that it creates many opportunities for people to gather and commit crimes. In particular, there has been a lot of research showing that the increase in green areas has an increasing effect on crime occurrence, which on the result has a decreasing effect on crime occurrence.

As an economic factor, the Social Assistance Recipients Ration, a variable representing poverty, had a different impact on each types of crime. The gap between social classes can hinder social integration and lead to crime as result. Result shows that areas of economic poverty have an effect on increased homicide and robbery. In the case of rape crimes, the point of view is that they are part of sociopathic behavior caused by a sense of social deprivation rather than related to economic. Prior to the results, it was thought that there was a positive relationship between sexual assault and poverty as a factor that interfered with social integration. However, analysis shows that an increase in economic poverty has a reduced effect on sexual assault.

Based on the occurrence of total crime, murder, sexual assault and robbery density, this study derived variables that effect crime occurrence, and analyzed the relationship between socio-demographic,

spatial, economic and environmental variables and crime occurrence density using data from 74 districts in urban area, and made policy suggestions for crime reduction based on the research. The increase in the foreign population by region has a positive relationship with total crime, homicide and sexual assault, which can be a factor that hinders social cohesion as its citizens may initially have an ostracized attitude toward other cultures. Also, given that the disparity between classes could hinder regional integration, I think the creation of a cohesive community is the most important way to reduce crime. Therefore, I think it is important to create a space or event where many people in the region can gather to communicate for the sake of regional. Although there were differences in the effects of each variable depending on the type of crime, the increase in green areas and the increase in the number of urban parks affected reducing all crimes. Crime is more likely to occur at night and in blind spots. Generally speaking, the park has more blind spots at night, creating fear of crime. However, if a urban park is created through the proper distribution and designs such as CPTED, it can play an important role in reducing crime. Therefore, when developing cities, it can be expected that the formation of regional greenhouses and the creation of parks will reduce crime. More micro-crime data at the street block level is needed to better understand the causes of crime. The lack of access to micro-crime data has limited the ability to perform district-level analysis. If spatial factors are further specified in the future, it is likely that more detailed factors will be derived for crime. Realistically, if the data of a crime is disclosed, the area could be turned into a dodgy zone, so measures to deal with it should be discussed as well.

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