Original article

The spatial correlation between social capital and crime: A case study of the new town of Pardis, Iran

Rama Ghalambordezfooli^{1*}, Fatemeh Hosseini²
¹Department of Urban Planning, Pardis Branch, Islamic Azad University, Pardis, Iran

²Department of Urban and Regional Planning, Faculty of Built Environment, University of Malaya, Malaysia

E-mail address (*corresponding author): ramaghalambor@gmail.com

ORCID iD: Rama Ghalambordezfooli: <https://orcid.org/0000-0003-0809-9087>; Fatemeh Hosseini: <https://orcid.org/0000-0003-4460-0828>

ABSTRACT

The crime rate can vary in different geographical areas, and several studies have tried to explain the crime rate by concentrating on the socio-economic characteristics of an environment. The literature on the subject shows a lack of attention to spatial analysis and its relationship which this research attempts to address. The main aim of this study was to investigate the spatial correlation between social capital and crime in the city of Pardis in Iran. A five-point Likert questionnaire survey was conducted among 297 citizens of the new town of Pardis. The survey included 27 questions about the social capital component (trust, attention, awareness) and crime hotspots collected from the police office. A mapping raster layer of both crime and social capital and Band Collection Statistics Tools in ArcGIS were used to show the spatial correlation between crime and social capital. The main findings of this study revealed that there was a statistically significant reverse correlation between social capital and crime in the correlation matrix. The study also illustrated that some of the crime subsets such as fighting ($r = -0.74$), family conflicts ($r = -0.72$), and moral crime ($r = -0.62$) were more related to social capital than other social capital components in a neighborhood.

KEY WORDS: spatial correlation, social capital, spatial analysis, crime rate, Pardis, Iran

ARTICLE HISTORY: received 21 July 2019; received in revised form 30 October 2019; accepted 13 November 2019

1. Introduction

This research builds on the existing foundation of research into social capital and crime by incorporating spatial analysis techniques which will provide a unique insight into this relationship. As COLEMAN (1988) stated, the term "social capital" could be global in contemporary sociology. Social capital's called, in part, the capacity to stimulate a sense of the significance for social relations as distinct from the economic services of people. Also, as LIN ET AL. (2001, p.vii) observed, the various meanings of social capital "captured the essence" of concepts that were central to the sociological heritage, such as social integration, social cohesion, unity, and social disorganization.

The concept of social capital is viewed as a vital component of the community-oriented policing philosophy (MARTIN, 2002). WEISBURD ET AL. (2015) argued for the relevance of social controls over people in place-based policing such as crime prevention. Moreover, there have been a number of studies, which carefully considered the association between social capital and crime (AKÇOMAK & TER WEEL, 2012; BALL ET AL., 2010; BEYERLEIN & HIPP, 2005; BUONANNO ET AL., 2009; LEDERMAN ET AL., 2002; SAEGERT ET AL. 2002). In their research, AKÇOMAK & TER WEEL (2012) assessed the impact of social capital on crime in the Netherlands. They present a methodology to measure the social capital; they illustrated the association between social capital indicators and crime in 142 municipalities in the

Netherlands. They mentioned that social capital provided a better and in depth understanding of crime.

MARTIN (2002) debated in his research that higher levels of social capital were shown to be associated with lower burglary rates. Social capital, when added to the models, mediates the effects of age composition and poverty. This result confirms recent research suggesting the linkage between social capital and collective efficacy in neighborhoods (WEISBURD ET AL., 2015). Neighbourhoods with active community organizations and politically active citizens are better able to control crime. The results of spatial regression demonstrated the added explanatory power offered by employing spatial regression models to determine the association between neighbourhood social capital and crime (TAKAGI ET AL., 2012).

Over the last decade, GIS mapping and analysis have been applied instead of the table of statistics in some social research. Descriptive analysis is run to organize information such as demographic that we barely, if ever, think about its significance in GIS-related studies (NICOL, 1999).

In this way, assessing social capital based on geographic-based analysis can help to provide a better and in-depth understanding of social capital. The smaller the scale for measuring social capital in the study area, the more accurate the results of the analysis will be. Mapping and visualizing can make social capital more understandable and can help to show how social capital would change across the area, which should result in reducing the confusion. Since, there was a need to move forward into "a spatially integrated social science" (GOODCHILD & JANELLE, 2004), this study attempted to address this gap through the spatial analysis of social capital and crime. Advances in the technical and theoretical prowess associated with geographic science, are more likely to happen in interdisciplinary and multidisciplinary fields of study. Thus, an integration between geographic-based analysis and social science is required.

Disparities in geographical conditions, socio-economic, and cultural characteristics in different time-periods can result in a different geographical record of crime. These differences may lead to the scattered distribution of social disorders in geographical units; so, spatial analysis in social science is crucial to find out more about places and social disorders.

Crime mapping is a method which can play a role in preventing crime (CHANEY & RATCLIFFE, 2013). Some places provide more opportunity to commit a crime based on their physical conditions

or even the socio-economic status of their residents (OMAHA, 2007). Assessment of spatial conditions and opportunities to provide strategies to remedy the situation by enhancing the neighbourhood resilience to social disorders are the most important aims of geographical assessments of crime in cities.

According to PUTNAM (1995), social capital is the "connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them." The concept of social capital was introduced to be a key component in building and maintaining democracy. In a report by the World Bank (GROOTAERT & BASTELAER, 2001) they itemized six dimensions of social capital which were: (1) group and network, (2) trust and solidarity, (3) collective action and cooperation, (4) information and communication, (5) social cohesion and inclusion, and (6) empowerment and political action. These dimensions were also emphasized by others, such as PUTNAM (1995). Recent methodological research has shown that sizes calculated from different social capital measurement instruments indicate very different aspects of social capital and that separate measures from separate instruments also have a different predictive value for different outcomes of social capital (KAWACHI ET AL., 2008). Therefore, the selection of measurement instruments should be based on the specific research interest, for which a general research strategy has been proposed (VAN DER GAAG, 2005; VAN DER GAAG & SNIJDERS, 2003). The current study should follow the components of social capital, which decrease crime. Nonetheless, there were some other components of social capital such as social cohesion, which had a positive effect on crime (GROOTAERT & BASTELAER, 2001). The current study, followed Claus Offe's model of social capital components as cited by PUTNAM (2002), in which all three introduced components of attention, participation, and trust have the reverse effect on crime.

As PUTNAM (2002) mentioned, social capital can be identified using the three components of attention, participation, and trust. However, there were some other parts of social capital like social cohesion which were excluded in this study. The reason for this is that some believe that social cohesion may cause more conflicts in different ways (SAEGERT & WINKEL, 2004; SAEGERT ET AL., 2002). They suggested that social cohesion among neighbours may be based on their willingness to intervene in neighborhood activities that lead to disorder. They argued that social disorganization led to more crime in the studied religious communities which were close bond. Furthermore,

strong relationships among people may facilitate criminals' actions in a society. When a sense of social relationships is strong, a group of people may plan to commit a crime.

Therefore, in this study, the those components of social capital towards crime were considered that are positively would affect crime (they would reduce the crime). In this way, components such as social cohesion eliminated, and "attention" measured instead. Indeed, components, which would reduce the crime rate, were measured. Social capital can decrease lawbreaking by strengthening the relationship between a person and his or her society and enhancing the sense of trust between people. Another social capital's factor was people's attention to each other which can increase the capacity of a society to understand the rules and as a result, to decrease the crime rates. According to PUTNAM (2002), participation indicated one's actual engagement in informal networks or formal associations, such as sports clubs, environmental networks, religious associations, nongovernmental organizations (NGOs), or social movements. Thus, in this study, participation, trust, and attention were considered as three components of social capital, which relate to crime.

2. Materials and methods

The study was located in the new town of Pardis in the Bumehen District of Pardis County, Tehran Province, Iran. In the 2011 census, its population was 25,360, with 7,228 families. Pardis is a newly planned town that absorbed over 9,775 inhabitants in 2001 (STATISTICAL CENTRE OF IRAN, 2016). This study used a large observational and cross-sectional study design. The sample size was calculated using the population survey method of COCHRAN (2007) to measure social capital in this case study.

A minimum sample size of 297 or more was required, and this made up the population size of the citizens drawn for this survey. The study ultimately employed a sample $N = 297$ and used citizens aged 15 years and above. Samples were selected through spatial random sampling using ArcGIS 10, because data should be collected from the specific point (living place of residents) to run the spatial correlation tools. The process of GIS analysis is indicated in Figure 1. This diagram shows a flowchart of the GIS analyses methods which were applied to the research.

Fig. 1. The process of GIS analyse

This study required two sets of spatial data to find a spatial correlation, including social capital and crime. First, data concerning crime were received from reports of the Official Police of Iran (NAJA). These data included 436 crime cases in the city of *Pardis* from 2011 to 2014. Murder and political crimes were excluded from the reports of crime since these data were confidential. The other six types of crime based on NAJA classification were: (1) moral crime¹, (2) sabotage, (3) family conflicts, (4) fighting, (5) property crime, and (6) financial crime.

Second, a survey, including 30 questions was conducted to measure the social capital's components including trust, attention, and participation. A five-point Likert scale of strongly agree (5), agree (4), somewhat agree (3), disagree (2), and strongly disagree (1) was used to rank the questions related to these three components. Citizens were given 20 minutes to fill in questionnaires which were distributed from 7:00 a.m. to 7:00 p.m. A pre-test was conducted among 29 citizens to test the reliability and validity of the survey in phase 1 and phase 2 (residential areas) of *Pardis New Town*. Cronbach's alpha was used to test the reliability of social capital components. Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test) was used to check whether the sample is big enough. In this study, the value of 0.931 shows a high sample adequacy.

To run the analysis, first, crime and social capital data were transferred to the ArcGIS as a raster layer. The value of the social capital of each household was counted as one spot and then, using the Kriging technique, it was interpolated. Second, Band Collection Statistics (BCS), a tool in ArcGIS 10, were used to investigate whether there was any spatial correlation between crime spots and social capital. The Band Collection Statistics tool would provide multivariate statistical analysis of a set of raster bands (ERDEY-HEYDORN, 2008). This study used Band Collection Statistics tool to find the cell's social capital and crime changes (a cell refer to a unit of network in GIS divitin of an area).

A dot map is a set of points located on a plan, where each point represents the location of an event (OKABE, 2016). As mentioned before, to implement such an analysis, the distance between dots was calculated.

For our study, the power of GIS mapping can help to provide a better understanding of the

information available for each position. In addition, the spatial analysis helps to assess every component of social capital in relation to a crime in an explicit way. For instance, it enables the researcher to work on cells in a geographical context, which is more accurate than a neighborhood-level scale.

3. Results

The main aim of this study was to assess the spatial correlation between social capital and crime in *Pardis New Town*. Figure 2 shows the dot map of crime in the study area. Using crime event location data for the new town of *Pardis*, the current study generated a crime hotspot map produced by the use of the Kernel Density Estimation (KDE). In this way, Figure 3 shows the raster layer of crime density, which was created from the various types of crime recorded in *Pardis New Town*. This figure shows the concentration of all types of crime.

When setting the parameters for the Kernel Density Estimation in ArcGIS, results of a recent study showed that the interpolation method had a considerable effect on predictive accuracy, grid cell size had little to no effect, and bandwidth (search radius) had some effect (HART & ZANDBERGEN, 2014). For the current study area, the default radius setting in ArcGIS was 400 meters, as the successful prediction of crime events generally declined as search radius increased (CHAINEDY ET AL., 2008). Crime density were areas of concentrated crime incident locations that demonstrated a nonrandom pattern in space. It is necessary to mention that spatial scale was another key factor in this study. The size of each cell should be equal to one another in order for the statistical data of social capital and crime to be comparable. Thus, the number of "100" square meter is allocated to the size of each cell for both social capital and crime, which was an average size of a census tract in the city.

The total social capital was measured through the use of the three components of trust, attention, and participation. The main findings of this research revealed that 64.1% of the respondents reported the "high" score of social capital, followed by a "low" level at 33.3% of participants and just below 3% of the respondents reported a "very low" score of social capital. The next step was to map the social capital. Thus, the dot map of social capital was generated based on the location where each respondent lived (Fig. 4).

¹ Some types of crime such as rape and prostitution are divided as moral crime in the area of study.

Fig. 2. The crime dot map of the study area

Fig. 3. Crime density map of Pardis new town

Fig. 4. Map of social capital of Pardis' residents

Moreover, this study measured the spatial correlation between social capital and crime, and this correlated with six different types of crime which were assessed using the Band Collection Statistics (BCS) tool. The main results of this assessment are illustrated in Table 1. Family conflict, followed by fighting, and moral crime were found to be more spatially associated with the crime rate than other social capital components in the city of Pardis.

Table 1. Spatial correlation of social capital and crime

Types of crime	Spatial correlation with social capital in a correlation matrix
1. Family conflicts	-0.74
2. Fighting	-0.72
3. Moral crime	-0.62
4. Sabotage	-0.52
5. Robbery	-0.31
6. Financial crime	-0.31

4. Discussion and conclusion

This study utilized spatial tools to investigate the correlation between social capital and crime in Pardis new town. The findings of this research are divided into two main categories. First, this study confirmed the spatial correlation between social capital and crime (BARNETT & MENCKEN, 2002; MARTIN, 2002; BUONANNO ET AL., 2009), and this association was also statistically significant as shown by other studies. Second, the findings of this study also revealed that social capital was related to some specific types of crime, including family conflicts, fighting, and moral crime (e.g. prostitution, rape). Other types of crime such as sabotage, robbery, and financial crime had a moderate correlation with social capital. This difference could be explained by the crime factors, which may stem from either inside or outside of the neighbourhood. Specific types of crime such as sabotage, robbery and financial crime were usually committed by outsiders, while family conflicts, fighting, and moral crime were related to inside factors. Social capital could positively affect neighbourhood social network which people make. However, public awareness, as one of the social capital components, could be used to prevent the outside factors of neighbourhood crime. Public awareness can be increased by teaching them how they behave when facing a crime scene through seminars or courses (open to public).

People living in a neighbourhood with a higher level of social capital are more likely to report unusual activities. People with more social cohesion in an area are more aware of their neighbour's environment. In a neighborhood with a strong social relationship among neighbours, crime is likely to be lower. The spatial part of the findings can be discussed as follows.

First is the key role of mapping in enhancing the power of imagination in order to understand social phenomena. Statistical results can be useful

to describe variables with fewer records, but interpreting large data set which are demonstrated in tables with too many columns and rows would be difficult. The data related to places are, therefore, better understood as maps with geographical data instead of tables.

Studies were conducted on assessing social factors and crime using spatial tools such as Geographical Regression (ANSELIN, 1999; TAKAGI ET AL., 2012). However, less attention has been paid to the capabilities of spatial analysis in creating maps of social phenomena using spatial methods. Creating a continuous layer of social capital and its spatial correlation with a crime in a place-based unit can have more effects on understanding this association than statistical analysis. This trend indicates how variables change when related to their location apart from their demographic. This approach can also be used to analyze other characteristics of a place in relation to the study variables such as social capital and crime. Therefore, moving from statistical methods to spatial analysis can give a better understanding of social phenomena.

Second, results of crime mapping are consistent with findings from previous studies using spatial analysis in which crime was found not to occur at random but occurs with a spatial pattern (MORENOFF ET AL., 2001; TAKAGI ET AL., 2012). Crime tends to cluster in certain places, and the adoption of administrative boundaries for neighbourhoods (in the multilevel model) would result in mostly null findings of the associations between social capital and crime events. Also, this result is consistent with the study of KAMBER ET AL. (2000).

Thirdly, the innovative part of this research was to use the BCS tool to assess the spatial correlation of social capital and crime. Though this tool is little used in social sciences research, it can be used to assess the associations between variables by careful attention to cell size and by creating raster layers.

Finally, the spatial analysis of social capital and crime provide more opportunities for an in-depth understanding of crime in a neighbourhood. Spatial analysis of a neighbourhood and social capital can give an accurate tool to consider the conditions within every single area of a neighbourhood. Social capital can also strengthen a person's resilience to social vulnerability, which may lead to preventing a person from committing a crime.

Some limitations of our study should be noted. The first limitation of this study concerns the inaccessibility of data due to the confidentiality of police data such that some types of crimes could

not be included in this study. Future studies should work on a wider range of crimes. Moreover, future studies may assess the role of gender in using social capital to reduce crime. It is also worth analyzing other factors such as mediators and moderators, which might affect the association between social capital and crime.

Acknowledgment

This study was funded by NAJA (Police official of Iran). We thank the NAJA (Police official of Iran) particularly Practical Research Center of Tehran's east Police Department that gave the important feedback on the ideas.

References

- Akçomak İ.S., Ter Weel B. 2012. The impact of social capital on crime: Evidence from the Netherlands. *Regional Science and Urban Economics*, 42, 1: 323–340.
- Anselin L. 1999. The Future of Spatial Analysis in the Social Sciences. *Geographic Information Sciences*, 5, 2: 67–76.
- Ball K., Cleland V.J., Timperio A.F., Salmon J., Giles-Corti B., Crawford D.A. 2010. Love thy neighbour? Associations of social capital and crime with physical activity amongst women. *Social Science & Medicine*, 71, 4: 807–814.
- Barnett C., Mencken F. C. 2002. Social Disorganization Theory and the Contextual Nature of Crime in Nonmetropolitan Counties. *Rural Sociology*, 67, 3: 372–393.
- Beyerlein K., Hipp J.R. 2005. Social capital, too much of a good thing? American religious traditions and community crime. *Social Forces*, 84, 2: 995–1013.
- Buonanno P., Montolio D., Vanin P. 2009. Does social capital reduce crime? *The Journal of Law and Economics*, 52, 1: 145–170.
- Chainey S., Ratcliffe J. 2013. *GIS and crime mapping*. John Wiley & Sons, London.
- Chainey S., Tompson L., Uhlig S. 2008. The utility of hotspot mapping for predicting spatial patterns of crime. *Security Journal*, 21, 1–2: 4–28.
- Cochran W.G. 2007. *Sampling techniques*. John Wiley & Sons, London.
- Coleman J.S. 1988. Social capital in the creation of human capital. *American Journal of Sociology*, 94: S95–S120.
- Erdey-Heydorn M.D. 2008. An ArcGIS seabed characterization toolbox developed for investigating benthic habitats. *Marine Geodesy*, 31, 4: 318–358.
- Goodchild M.F., Janelle D.G. 2004. *Spatially integrated social science*. Oxford University Press, Oxford.
- Grootaert C., Bastelaer T. 2001. Understanding and Measuring Social Capital: Social Capital Initiative. *Working Paper*, 24. World Bank, Washington, DC.
- Grootaert C., Bastelaer T.V. 2001. *Understanding and measuring social capital: a synthesis of findings and recommendations from the social capital initiative*. Washington, DC.
- Hart T., Zandbergen P. 2014. Kernel density estimation and hotspot mapping: examining the influence of interpolation method, grid cell size, and bandwidth on crime forecasting. *Policing: An International Journal of Police Strategies & Management*, 37, 2: 305–323.
- Kamber T., Mollenkopf J.H., Ross T. 2000. Crime, space, and place: An analysis of crime patterns in Brooklyn. *Analyzing crime patterns: Frontiers of practice*: 107–120.
- Kawachi I., Subramanian S.V., Kim D. 2008. Social capital and health. [in:] I. Kawachi, S. Subramanian, D. Kim (eds) *Social Capital and Health*. Springer, New York: 1–26.

- Lederman D., Loayza N., Menendez A.M. 2002. Violent crime: does social capital matter? *Economic Development and Cultural Change*, 50, 3: 509–539.
- Lin N., Cook K.S., Burt R.S. 2001. *Social capital: Theory and research*, Transaction Publishers, New York.
- Martin D. 2002. Spatial Patterns in Residential Burglary: Assessing the Effect of Neighborhood Social Capital. *Journal of Contemporary Criminal Justice*, 18, 2: 132–146.
- Morenoff J.D., Sampson R.J., Raudenbush S.W. 2001. Neighborhood inequality, collective efficacy, and the spatial dynamics of urban violence. *Criminology*, 39, 3: 517–558.
- Nicol A.A., Pexman P.M. 1999. *Presenting Your Findings: A Practical Guide for Creating Tables*. American Psychology Association Publications, Washington, DC.
- Okabe A. 2016. *GIS-based Studies in the Humanities and Social Sciences*, CRC Press, London, New York.
- Putnam R.D. 1995. Bowling alone: America's declining social capital. *Journal of Democracy*, 6, 1: 65–78.
- Putnam R.D. 2002. *Democracies in flux: The evolution of social capital in contemporary society*: Oxford University Press, Oxford.
- Saegert S., Winkel G. 2004. Crime, social capital, and community participation. *American Journal of Community Psychology*, 34, 3–4: 219–233.
- Saegert S., Winkel G., Swartz C. 2002. Social capital and crime in New York City's low-income housing. *Housing Policy Debate*, 13, 1: 189–226.
- Takagi D., Ikeda K.I., Kawachi I. 2012. Neighborhood social capital and crime victimization: Comparison of spatial regression analysis and hierarchical regression analysis. *Social Science & Medicine*, 75, 10: 1895–1902.
- Van der Gaag M. 2005. *Measurement of individual social capital*. (PhD), Groningen.
- Van der Gaag M., Snijders T.A. 2003. *A comparison of measures for individual social capital*. Paper presented at the conference "Creation and returns of Social Capital".
- Weisburd D., Davis M., Gill C. 2015. Increasing collective efficacy and social capital at crime hot spots: New crime control tools for police. *Policing: A Journal of Policy and Practice*, 9, 3: 265–274.