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Residential strategies patterns to offense prevention: A study in Vila Planalto, Brazil

Padrões de estratégias residenciais para prevenção criminal: Um estudo em Vila Planalto, Brasil

Patrones de estrategias residenciales para la prevención del delito: Un estudio en Vila Planalto, Brasil

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Abstract
The perception of the public (in)security and residential crime prevention strategies affect the urban design. This study aims to understand the patterns of offense prevention used by the residents of Vila Planalto, Federal District, Brazil, and evaluate how they might be correlated with the perception of safety in their neighborhood. We evaluated 1.180 houses on-site with a checklist to identify the crime prevention strategies used. Further, 206 randomly selected dwellers were interviewed, concerning their perception of safety in the neighborhood. Heat Maps showed that areas with high access control offered fewer opportunities for natural surveillance. Multidimensional scaling showed patterns of use of crime prevention strategies. There was no significant correlation between the perception of safety in the neighborhood and the amount of crime prevention strategies in the residence. However, the perception of well-lit was correlated with the perception of safety in walking during night and day. The present study helps identify decisions on crime prevention strategies and provides a prognostic for possible community interventions in the village.
Keywords: CPTED; Residential Strategies, Offense Prevention, Security Perception, Brazil.

Resumo
A percepção da segurança pública e as estratégias de prevenção criminal em residências afetam o design urbano. Este estudo conduzido como objetivo compreender o padrão de estratégias de prevenção contra ofensas utilizadas pelos moradores da Vila Planalto, Brasil, e também analisar a correlação com a percepção de segurança em seu bairro. Avaliamos 1.180 residências no local usando uma lista de verificação para identificar as estratégias de prevenção contra ofensas utilizadas. Entrevistamos 206 moradores selecionados aleatoriamente, questionando sua percepção de segurança no bairro. Mapas de calor mostraram que áreas com alto controle de acesso ofereciam menos oportunidades de vigilância natural. O Escalonamento Multidimensional mostrou padrões de uso de estratégias de prevenção ao crime. Não houve correlação significativa entre a percepção de segurança no bairro e a quantidade de estratégias de prevenção ao crime na residência. No entanto, a percepção de boa iluminação foi

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correlacionada com a percepção de segurança ao caminhar durante a noite e o dia. Estima-se que o presente estudo possa ajudar a identificar decisões sobre estratégias de prevenção ao crime e fornecer um prognóstico para possíveis intervenções comunitárias na Vila.

Palavras-chave: CPTED*;* Estratégias residenciais*;* Prevenção de Ofensas*;* Percepção de Segurança, Brasil.

Resumen

La percepción de la seguridad pública y las estrategias de prevención del delito en las residencias afectan el diseño urbano. Este estudio tiene como objetivo comprender el patrón de estrategias de prevención contra delitos utilizadas por los residentes de la Vila Planalto, Brasil, y también analizar la correlación con la percepción de seguridad en su vecindario. Evaluamos 1.180 residencias en el lugar utilizando una lista de verificación para identificar las estrategias de prevención contra delitos utilizadas. Entrevistamos a 206 residentes seleccionados al azar, preguntando sobre su percepción de seguridad en el vecindario. Los mapas de calor mostraron que las áreas con alto control de acceso ofrecían menos oportunidades de vigilancia natural. El Escalamiento Multidimensional mostró patrones de uso de estrategias de prevención del delito. No hubo una correlación significativa entre la percepción de seguridad en el vecindario y la cantidad de estrategias de prevención del delito en la residencia. Sin embargo, la percepción de buena iluminación se correlacionó con la percepción de seguridad al caminar durante la noche y el día. Se estima que el presente estudio pueda ayudar a identificar decisiones sobre estrategias de prevención del delito y proporcionar un pronóstico para posibles intervenciones comunitarias en la villa.

Palabras clave: CPTED; Estrategias residenciales; Prevención de ofensas; Percepción de seguridad, Brasil.

In the late twentieth century, several studies focused on strategies for crime prevention through the understanding of how physical and environmental characteristics of places encourage criminality (Matsunaga, 2016; Costa, 2017), considering that crime will occur with the conjunction of three main factors (a) a favorable environment, (b) an available victim or target, and (c) a potential offender (Felson & Clarke, 1998). In that sense, crime prevention strategies can be designed to increase the efforts and risks of a criminal act through changes in the environment and not only by controlling the behavior of victims and/or offenders (Cozens et al., 2005). For example, in empty streets or even in crowded areas with visual obstructions, theft cannot be seen and then mitigated by the community, underscoring the importance of physical modifications to enhance natural surveillance (Brantingham & Brantingham, 1995; Gehl, 2010).

Newman (1972) reported that as a space has characteristics such as a clearer definition of the public and private, it consequently becomes more defensible. Thus, when residents have greater social control beyond their homes, there is an increase in territoriality in the neighborhood and a tendency to reduce crime rates and space degradation. These same concepts also form one of the main theoretical frameworks for the formulation of Crime Prevention through Environmental Design (CPTED), which emerged with Jeffery in 1971. CPTED is an urban planning approach that seeks to reduce crime through the manipulation of the urban design itself, aiming to decrease the fear of crime and its incidence. Elements such as adequate lighting, well-utilized open spaces, and a layout that promotes natural surveillance are considered important in crime prevention (Armitage, 2017; Jeffery, 1971; Newman, 1972).

However, CPTED is a dynamic model that has been improved over the years to aggregate many categories of crime prevention based on practice and scientific research (Senna et al., 2022). From all three generations of CPTED, some fundamental categories remain as evidence-based strategies for safer cities such as (1) territoriality, representing the sense of ownership that users have over a specific location, contributing to the maintenance and use of these spaces, provided there is a clear demarcation between public and private. Stimulating this sense of belonging encourages natural surveillance of the spaces; (2) Natural surveillance, expressed by the capacity of the environment to enable visibility of public areas by residents. This visibility increases the possibility for inhabitants of buildings and residences to have some surveillance of the area, facilitating prompt reporting (Jacobs, 1961; Gehl, 2010); (3) Access control, which is determined by the clear demarcation of public and private spaces, with symbolic or physical barriers, reduces access or the approach of strangers, making them more easily perceived. This action also promotes surveillance of the spaces, creating a heightened perception of risk for potential offenders; (4) Image and maintenance, that is related to the care for spaces and the impression that the location is well-maintained. This point is directly related to one support theory called the Broken Windows Theory, which holds that social and physical disorder in urban spaces can encourage the occurrence of crimes (Wilson & Kelling, 1982; Costa, 2017). A vandalized, poorly lit, and neglected location gives the impression of abandonment, making it even less attractive and causing people to fear and avoid such places.

Later, Crowe (2000) also provided practical guidelines for implementing measures to improve each of the five relevant points for crime prevention through urban design, such as: 1) improving activities in the space to promote more effective user control and community gatherings in areas with natural surveillance, 2) reducing isolated locations by providing better integration of attractive areas for people within the urban fabric with efficient spatial organization, 3) promoting safe activities in areas with a higher perception of insecurity to increase the number of eyes on the streets, 4) clearly defining barriers and distinguishing between public and private areas, and 5) increasing the sense of territoriality. In this last perspective, CPTED also proposes enhancing social bonds and community engagement as crime prevention strategies, with a more integrated and sociological perspective (Cozens, 2008).

At an urban level of analysis, and close to the urban cognitive maps proposed by Kevin Lynch, scientific findings also corroborate that the mesh of cities has an important influence on defining the routes where individuals will perform their daily activities, shaping criminal decision-making (Brantingham, P.L., & Brantingham, P.J., 1993; Canter & Larkin, 1993;

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excluded for blind review). Thus, scientific literature from all around the world has pointed out a large interest in looking at the environment as a way to prevent crimes (Bennett, et al. 2008; Farrington & Welsh, 2002). However, the literature lacks an investigation that explains the residential strategy patterns for offense prevention to propose target prescriptions in urban areas.

The perception of insecurity and allocation of crime prevention strategies

Although we've discussed the importance of crime prevention strategies based on environmental changes, the perception of public (in)security also affects the urban design in a way that might not be effective. Each time residents' perception of their neighborhood security decreases, they might begin to change the environment and act individually to increase protection (e.g., by building higher walls and blind facades or laying barbed wires) (Andresen, 2017). It is not only today that we have heard that communities are getting more insulated from surrounding social conflicts in places like gated condominiums or big suburbs (Low, et al. 2012). However, those living in *"urban fortresses"* could create a false sense of security (or even no sense at all), acting to make cities lifeless, weakening natural surveillance and effective crime prevention strategies (Gehl, 2013, Jacobs, 1961).

Moreover, the perception of insecurity could also lead to imprecise and biased decision-making for crime prevention. For example, in Brazil, Bondaruk (2007) conducted interviews with Brazilian past offenders and verified that, although residents in this country consider high walls as an essential crime prevention strategy, burglars reported that this type of residence is preferable for their actions, once they cannot be seen while inside.

Concerning the impact of the environment on crime prevention, this study aims to analyze how residents of Vila Planalto, Brazil, define their strategies for crime prevention through architectural changes in their homes, and how this environment is correlated with their perception of security and geographic patterns. We choose Vila Planalto for being a well-defined community with clear boundaries, allowing the isolation of potential external variables derived from adjacent urban areas. We provide a comprehensive analysis taking into account the lack of studies integrating a multimethod and interdisciplinary approach, aimed at answering the following research questions:

Research question 1: Research question 1: *Are there patterns of crime prevention strategies distributed in the geographic area?*

Research question 2: Are *the amount of crime prevention strategies used by one's residence related to the perception of neighborhood safety?*

Method

Socio-spatial characteristics of Vila Planalto

The case-study area chosen for this study is Vila Planalto, located in Brasilia – Brazil, is a village geographically close to the city center (i.e., 6.6 km from the central business district), which can be reached in 10 minutes by car and 20 minutes by bike. Green areas and lawns isolate it from other neighborhoods (Coelho, 2008). It also has a total area of 0.69 km², of which 25.53% are open public spaces, such as roads, streets, and green areas, excluding institutionalized parks and plazas, which constitute 3.82% of Vila Planalto's area. The buildings do not exceed the limit of two pavements and are mostly (93%) for residential use. Vila Planalto has a high population density (102.35 inhabitants per hectare) for the number of facilities offered and is therefore considered a dormitory neighborhood in the heart of the country's capital (SEDUMA & CODEPLAN, 2009). To assist a population of 7,638 citizens, the neighborhood offers about 49 restaurants/bars, 11 churches, 9 mini-markets, 3 Pharmacies, one health center, one kindergarten, and one police station. Still, there were no active public schools or libraries in this village (Data extracted by direct observation of the researchers in the studied area). The geographic representation of the area can be visualized in Figure 1.

Figure 1
A geographic description of Vila Planalto with attributes distinguished by land use and types of spaces.

Source: Drawn by the authors, Adapted from Esri, HERE, USGS, and the GIS User Community.

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The last socio-economic housing survey conducted by the Planning Company of the Federal District, in 2009, reveals that Vila Planalto's population profile is as follows, the mean income per capita in Vila Planalto is 972 reais, which represents the middle-class average income, and its GINI index is 0,389 (CODEPLAN, 2015). Besides, the population has a similar percentage between women and men, while 21% of them are children and 11.7% are over 60 years old. The neighborhood has a good quality of life, calm daily commuting, and safety, according to the local police department considers the region safe. Despite the occurrence of drug-related crimes, there are almost no reports of violent crime or threats to residents (excluded for blind review).

This study encompasses data collected in two levels at two different moments during the period of 2018 to 2019, thus comprehending two studies that are integrated into section 2 of the results. The first study aimed to gather data about the physical characteristics of houses and buildings in terms of their crime prevention strategies through environmental changes. The second study focused on surveying citizens' perceptions of security in the neighborhood while engaging with it. We then merged the data of citizens' responses with the location where they live.

Study 1- Assessment of the characteristics of houses and buildings

Procedural for data collection and analysis

We evaluated the characteristics of the properties of Vila Planalto on-site. Two researchers, in peer-evaluation for quality and reliability control, assessed the morphological characteristics of properties with a checklist. This checklist was created to verify the presence of specific defensive strategies by the presence of the following items based on previous literature o defensible spaces and CPTED mentioned in the theoretical background (Jeffery, 1971; Newman, 1972; Cozens, 2008): (a) access control (i.e., is there access control in the residence, such as restricted access gates and physical barriers?), (b) territoriality (i.e., is there a definition of what is public and private?), (c) use of vigilance signages/cameras (i.e., are there signs of surveillance, such as cameras, electric grids, alarms and private security systems?), (d) presence of potential hiding places and blind spots, (e) maintenance of public equipment and care for image (i.e., does the environment show signs of vandalism or broken equipment?), (f) opportunities for natural surveillance (i.e., can people see and be seen from the inside out of their homes?), (g) wayfinding (i.e., are there signs indicating the location of the residence, so that strangers do not justify their inappropriate presence?), and (h) lightning (i.e., are there light

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poles around the house?).

Using the software application ArcGIS, v.10.4.1, we verified the geographic distribution of crime prevention strategies in Vila Planalto. A Hot-Spot Analysis, based on the midpoints of the lot facades, was conducted using the Kernel Density tool, which reveals regions with a higher frequency of those strategies. This type of geographic representation shows the density of certain attributes, which are represented by the change in the spectrum of colors in a continuum (Downs & Horner, 2007). Red zones on the map represent areas with a higher density of the attributes investigated (e.g., access control, territoriality, presence of potential hiding places, and blind spots). They are created by forming a buffer around each variable allocated in the map; when buffers are overlaid, they become darker in shade (DeBoer, 2015). To verify how crime prevention strategies are grouped in an Euclidean space, Multidimensional Scaling (MDS) was performed using Statistical Package for the Social Sciences (SPSS), v. 23. MSD can show in the physical environment of the village the frequency, proximity, and distance among all variables analyzed in the physical environment of the village. Thus, it supports the spatial representation of the data structure in an Euclidean space, in which the distances among such variables reflect the relations or the structure of a specific construct (Canter, 2012), where the distances among its elements indicate the strength of their relation (Young, 2013).

Spatial Sample

We reached data on crime prevention strategies from 1,180 properties. From those territories, 964 were residences, 33 were commercial venues, 10 were workshops, 133 were mixed-use, 20 were for institutional use and 20 had no identification. Based on our descriptive data, *Vila Planalto* had moderately high levels of defensibility and accessibility, with 99% of households showing territoriality, 75.7% containing wayfinding signages, 74% having access control, and 44% sharing natural surveillance among dwellers. Only 20% of them show signs of vandalism and lack of maintenance, and 20% feature potential hiding places for criminal actions.

Study 2- Assessment of citizens' perception of (in)security.

Participants

In this study, 349 randomly selected dwellers from Vila Planalto were interviewed. However, only 206 participants were included in this study because of the impossibility of integrating the addresses of some participants into our previous data collection and also due to missing and incomplete responses. Among the selected participants, 59.22% were female with

an average age of 44.48 years (*SD*= 16.917). The decision to calculate the sample size considered the total number of residences in the neighborhood by calculating what would be a representative sample, by using the population and a confidence level of 95%. Then, to select the participants, a simple randomization method from a list of addresses from the governmental data was used to verify the adequacy of the spatial distribution in the polygons representing the lots of Vila Planalto, using a process of georeferencing.

Procedural for data collection and analysis

We surveyed participants on-site to assess the perception of safety from crimes in the neighborhood, by using the Portuguese version of the Neighborhood Environment Walkability Scale - NEWS (Adams, et al., 2009; Malavasi et al.,2007). After approval from the ethics committee (IRB 1.831.179/2016- University of Brasilia), we initiated an in-person interview with participants who filled out a consent form and were told that they could leave the survey at any moment. The questions, answered on a four points scale ranging from 0-totally disagree to 3- totally agree, asked: (a) Is there a lot of crime in your neighborhood?, (b) Does crime make it unsafe to walk around your neighborhood during the day?, (c) Does crime make it unsafe to walk around your neighborhood at night?, (d) Are pedestrians and cyclists using the streets in your neighborhood easily seen by residents from inside their homes?, (e) Are the streets in your neighborhood well-lit at night?, (f) When you walk around your neighborhood, do you see and talk to other people? This presents valid evidence for the study context (excluded for blind review). An expert committee review conducted by nine experts in the fields of architecture/urbanism, environmental/traffic psychology, and epidemiology evaluated the suitability of the questions and we pre-tested the questionnaire with 30 students and residents of the different neighborhoods in the Federal District of Brazil, to verify if the instrument was understandable and clear to participants in our region.

Before the data collection, a presentation letter was sent to the selected addresses, to sensitize the residents and communicate that soon they would receive the visit from the researcher to conduct the interview. A team of trained interviewers administered door-to-door surveys and attempted to contact an adult (aged 18+) in each of the randomly selected households. Once the researchers were in the field, a supervisor provided all the needed information, monitored the fieldwork, checked out the interviews, and provided any material asked by the researcher. Answers were registered on a tablet and transferred to an online platform. In conducting the interviews, we followed Brazilian institutional ethical standards and received approval from the ethics committee board. All the participation was voluntary and

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participants were free to leave the study at their will. They also received an informed consent form with all details regarding the research and the researchers involved, including contact for any needs.

Data collected during the interviews were tabulated and associated with the geographic location of each participant´s residence. The final database compiled the data collected during Study 1 and Study 2: the location of each residence, the dwellers' perception of crime safety, and the types of crime prevention strategies used in their homes. For calculation purposes, each home was assigned a level of a crime prevention strategy, ranging from 0 - no crime prevention strategy used to 7- seven types of crime prevention strategies used. Finally, we conducted Pearson Correlation by combining all variables.

Results

Study 1: Are there patterns of crime prevention strategies in Vila Planalto?

Heat Maps showed that some strategies taken by the residents are concentrated in specific areas and congruent with the geographical juxtaposition of urban resources and facilities. The area with the highest opportunities for natural surveillance (black in Figure 2) has more presence of disorder, and less access control (Figure 3). This could be seen if we compare Figures 2, 3, and 4, especially in the northern part of the village. The area next to the road "Estrada Hotéis de Turismo" (Road on the north part of the Vila), has a high concentration of restaurants, compared to other areas in the village. This area has high opportunities for Natural Surveillance (Figure 2). This area coincides with the area that has a lack of disposition of access control (Figure 3) and more concentration of vandalism (Figure 4). It is interesting to notice that high opportunity for natural surveillance, in theory, should have a negative relationship with the presence of disorder, which is the opposite found in the present study. One possible explanation might be related to the high flux of individuals in a vulnerable space for criminal activities, being a path from the offender's routine. Moreover, in that area, there is a lack of vigilance equipment and signs, as well as other disorder areas, as shown in Figure 7.

Besides that, when residents invest more in controlling access to their homes, and building higher walls, for example, they give up natural surveillance (Figure 5). This last can backfire on security, once citizens hide behind high walls to create a false sense of security. However, this can generate a space that does not contribute to community security and also might facilitate offenders when they enter one's home, by obstructing the visibility of their actions by others.
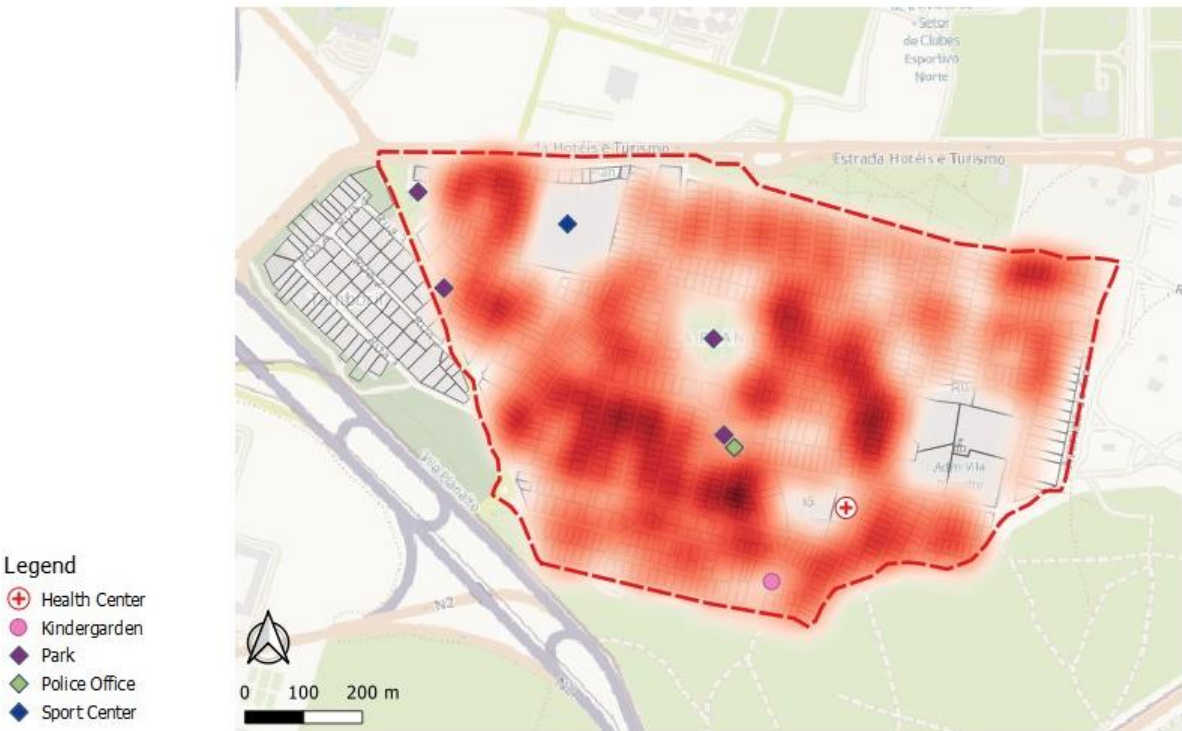
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Figure 2

Presence of clear disposition of natural surveillance.
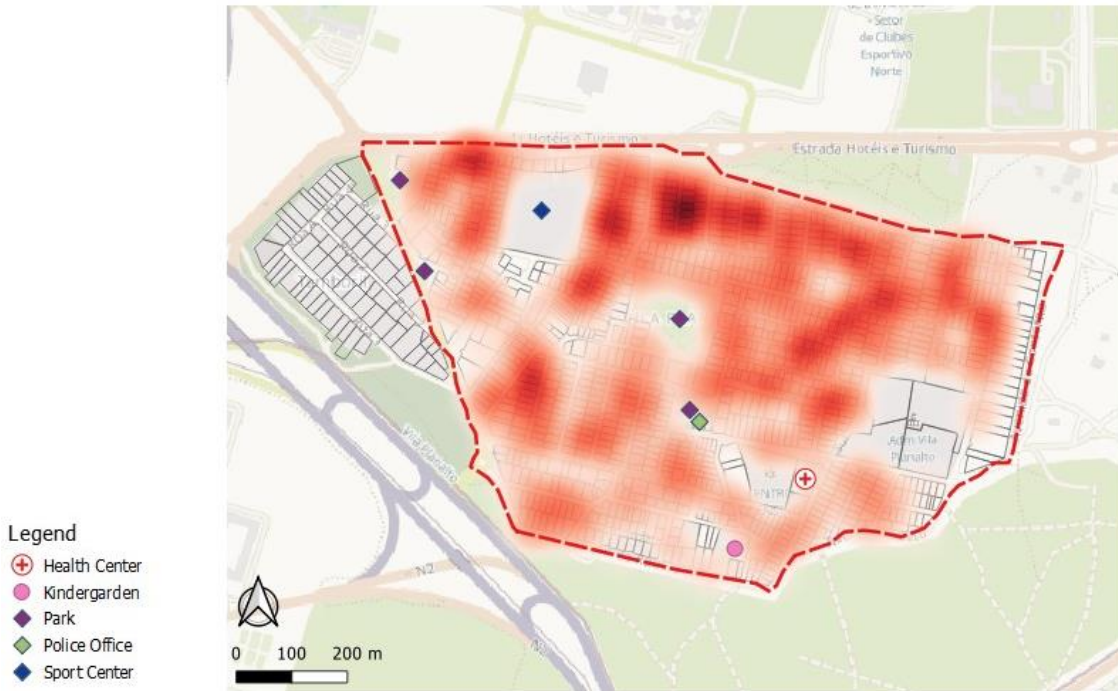
Source: Drawn by the authors, Adapted from Esri, HERE, USGS, and the GIS User Community.

Figure 3

Presence of clear disposition of access control.
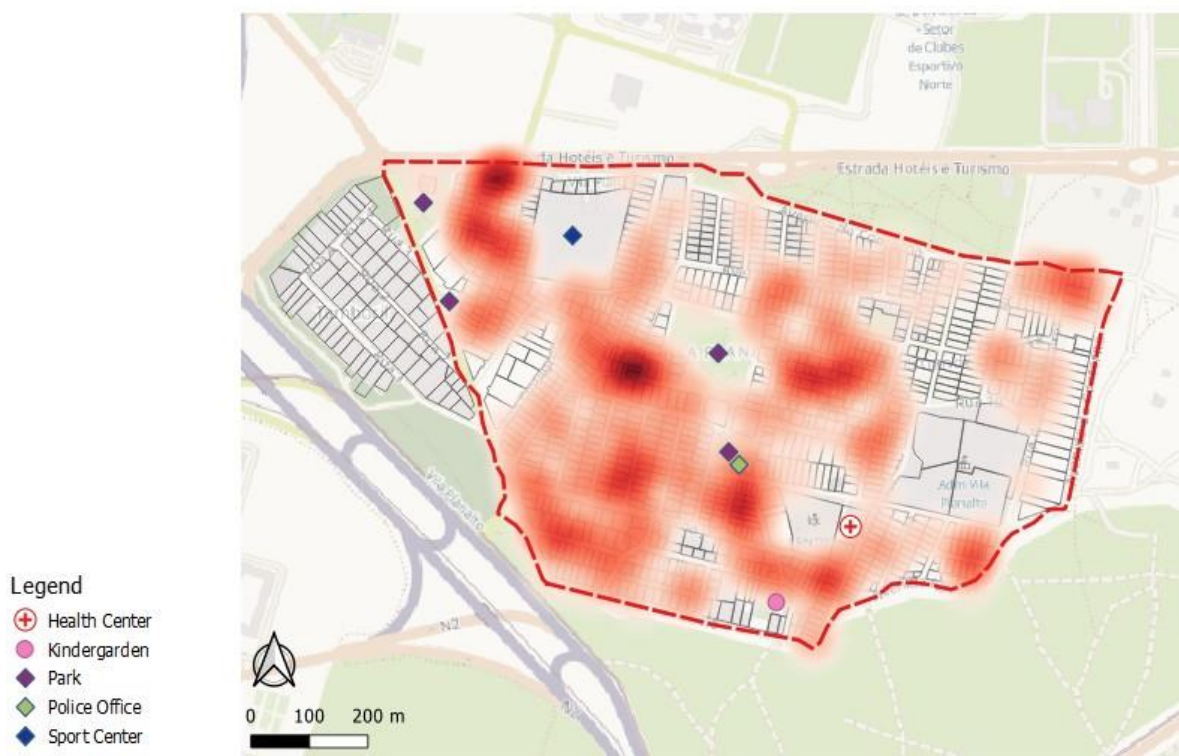

Source: Drawn by the authors, Adapted from Esri, HERE, USGS, and the GIS User Community.

Figure 4

Presence of disorders, lack of maintenance, and/or vandalism.

Source: Drawn by the authors, Adapted from Esri, HERE, USGS, and the GIS User Community.

Figure 5

Housing in Vila Planalto with high access control, but lacks natural surveillance.


Source: Photo taken on-site by the authors.

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Vigilance signs and equipment are more present in the eastern part of the village, which is close to a zone occupied by displaced people adjacent to Vila Planalto and also the area with higher income residences, which might have more resources to invest in crime prevention strategies and be more willing to isolate themselves from the displaced zone (Figure 5). This is also complementary to what we can also see in houses in the southeastern part of Vila Planalto, where there is a high concentration of access control and a lack of natural vigilance (Figures 2 and 3).

Figure 6
*Presence of vigilance equipment.*
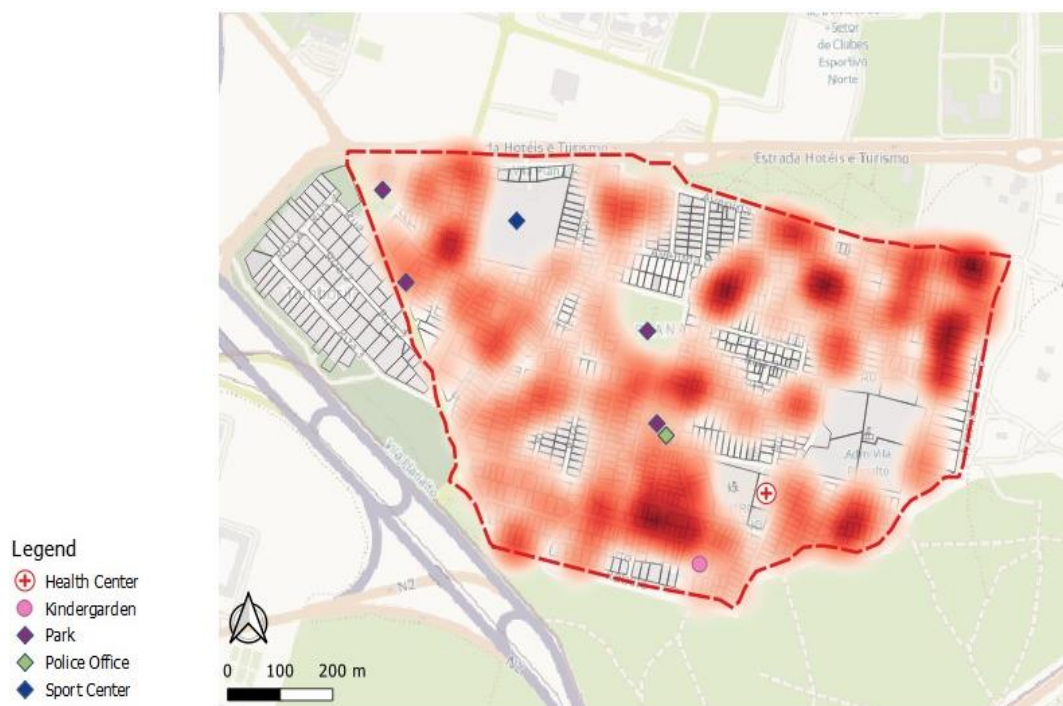
Source: Drawn by the authors, Adapted from Esri, HERE, USGS, and the GIS User Community.

As seen in Figure 7, it is generally easy to locate oneself in Vila Planalto. Signs are pointing out where you are at almost any place, except for a few areas that seem to not correspond to any geospatial pattern with the other variables, besides the lack of territoriality in some shared points, as can be seen in Figure 8. The eastern park (i.e., communitarian space) of Vila Planalto, where the higher-income residences are located, also lacks sign and wayfinding opportunities.

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Figure 7

Presence of wayfinding opportunities.
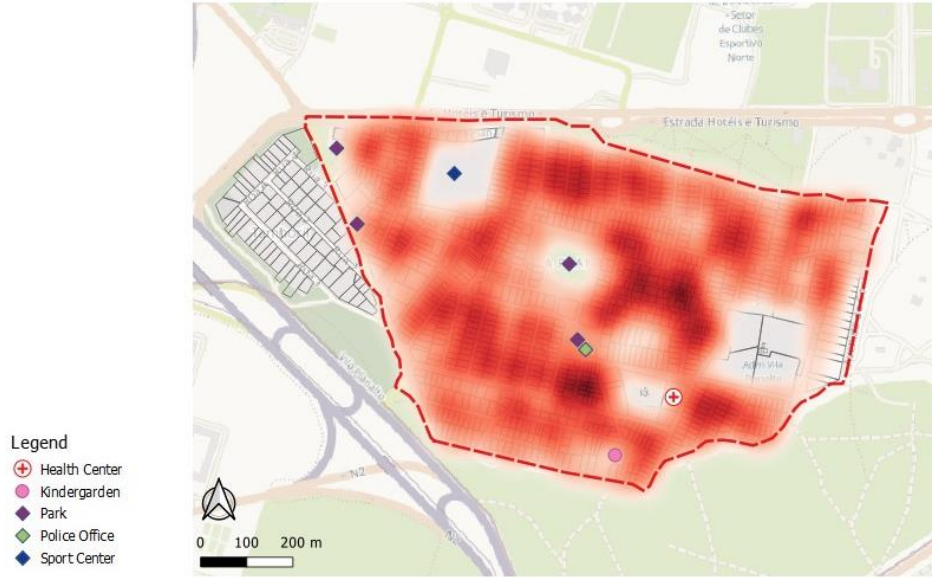
Source: Drawn by the authors, Adapted from Esri, HERE, USGS, and the GIS User Community.

Clear demarcation of territoriality is seen as almost uniform around the village, which might be a characteristic of mostly Brazilian communities (Figure 8).

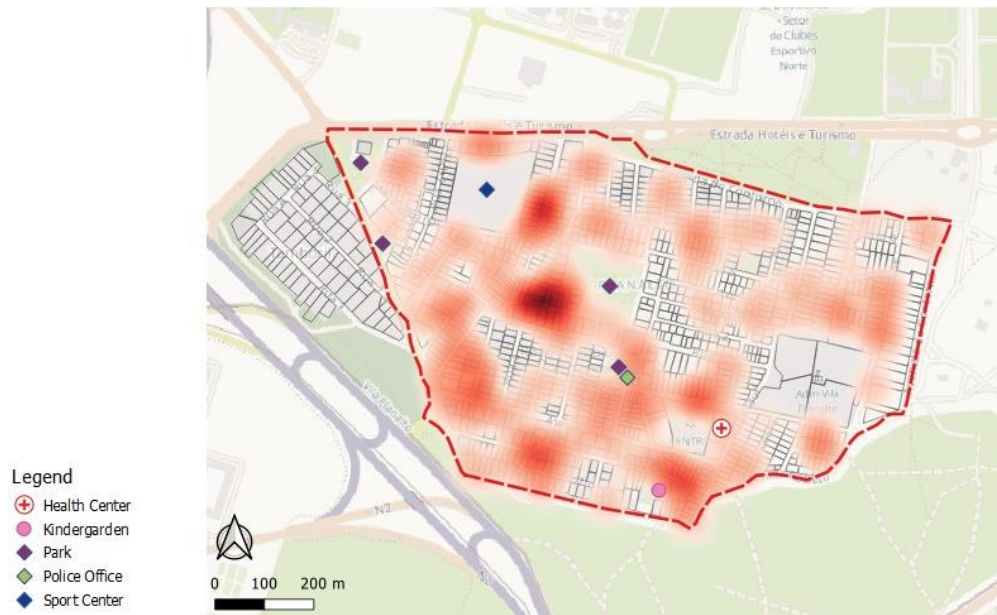**Figure 8**

Presence of a clear definition of territoriality.
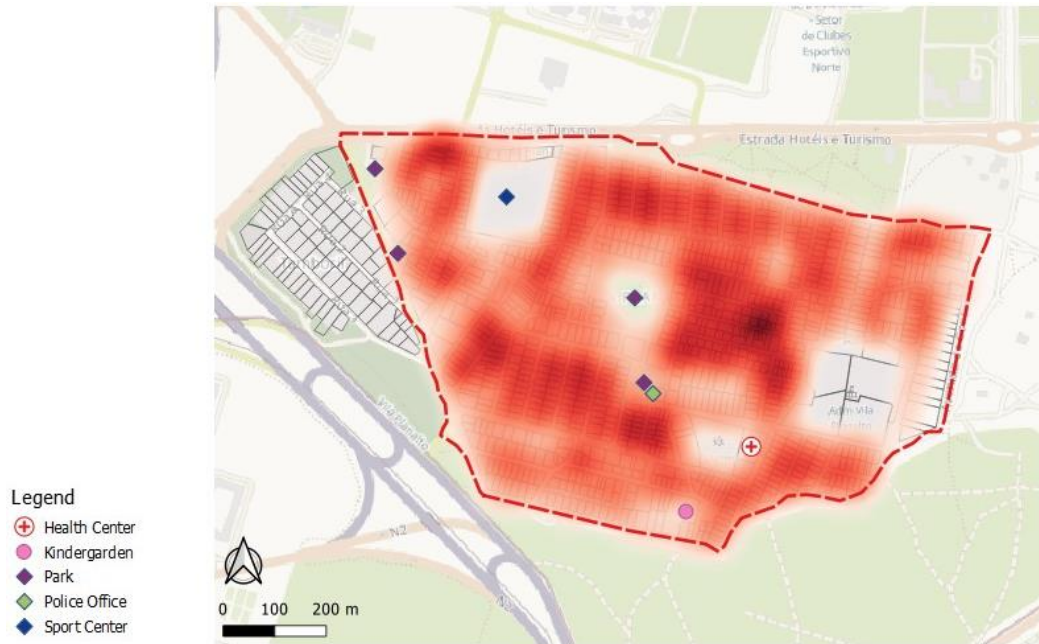
Source: Drawn by the authors, Adapted from Esri, HERE, USGS, and the GIS User Community.

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Figure 9 shows some concentration of potential hideouts and blindspots that can limit the vision rays from residents and offer opportunities for offenders to act by surprise. This hideout limits the vision ray from residents who might be surprised by offenders hiding in those places.

Figure 9
Presence of hideouts and blindspots.

Source: Drawn by the authors, Adapted from Esri, HERE, USGS, and the GIS User Community.

Figure 10
A residence with a blind spot in the gate, where offenders can potentially hide an offender from the vision of those who come to the house from the left or right side.


Source: Photo taken on-site by the authors.

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To visualize the relationship between proximity and distance of the crime prevention strategies in a two-dimensional layer, we used multidimensional analysis (MDS) with the Fruchterman-Reingold algorithm based on the facet theory (Canter, 2012). We have verified that the presence of wayfinding is the most commonly correlated variable between all of them, once signs of vigilance and natural surveillance are the variables with less correlation with each other. Meanwhile, territoriality, image and maintenance, and non-blind spots seem to be grouped as common strategies used at similar times. Once again, natural surveillance showed less proximity with access control. But different from what is speculated from the geographic distribution, the presence of natural surveillance, overall, has closer proximity to image and maintenance (i.e., lack of vandalism and disorders).

Figure 11
Degree of the relation among each crime prevention strategy.
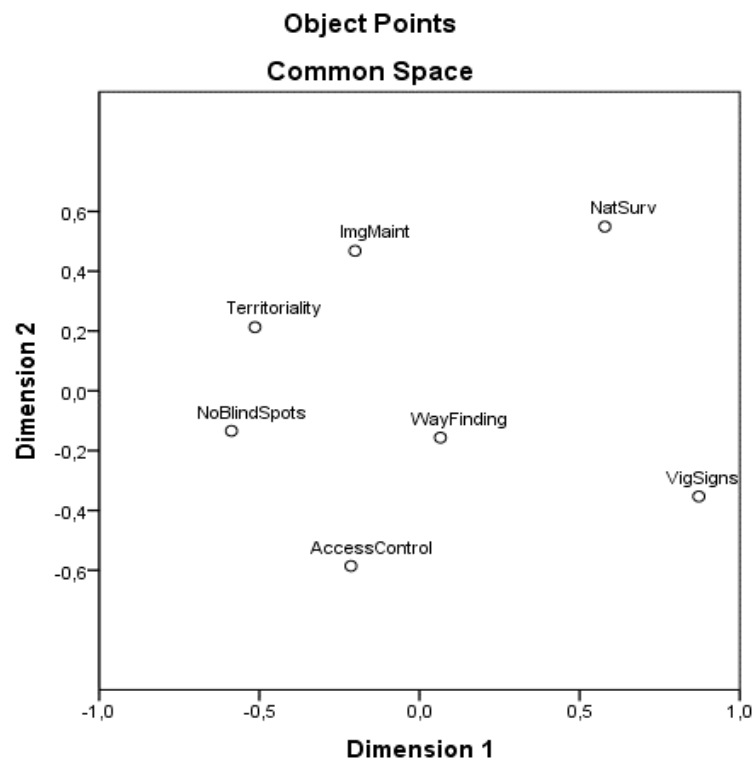
Note: ImgMaint= Image and Maintenance; NatSur=Natural Surveillance; Territoriality= Territoriality; NoBlindSpots= No blind spots; AccessControl= Access Control; WayFinding= WayFinding; VigSigns= Vigilance Signs and Equipments.

Source: Generated by the authors.

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Study 2: Are the amount of crime prevention strategies used by one's residence related to the perception of neighborhood safety?

Higher scores in Q1, Q2, and Q3 indicate that residents positively perceive Vila Planalto, in terms of lit, talking to other people, and walking or cycling on the streets. Lower scores in Q4, Q5, and Q6 point that the crime rate in the neighborhood is low, making it safe to walk during the day and at night. The descriptive results of the survey can be visualized in Table 1.

Table 1
Items of the questionnaire followed by their means and standard deviation.

Items	M	SD
Q1. Are the streets in your neighborhood well-lit at night?	2.45	.90
Q2. Are pedestrians and cyclists using the streets in your neighborhood easily seen by residents from inside their homes?	2.00	1.15
Q3. When you walk around your neighborhood, do you see and talk to other people?	2.42	.95
Q4. Is there a lot of crime in your neighborhood?	1.05	1.05
Q5. Does crime make it unsafe to walk around your neighborhood during the day?	.33	.69
Q6. Does crime make it unsafe to walk around your neighborhood at night?	.97	1.10

We found no correlation between the usage of crime prevention strategies in the residence and it isn't correlated with the perception of neighborhood security. Living in a fortified residence with crime prevention strategies might not mean that one perceives, for example, that there is more or less criminality or that it is safe or not to walk in the neighborhood during the day or night. Thus, it is not possible to state that people put more effort into crime prevention strategies because of their perception of insecurity in the neighborhood. Also, we found no correlation between the perception that the neighborhood is well-lit and has natural surveillance with the general perception of criminality. However, lighting correlates with the perception that it is safe to walk during the day and night in the neighborhood.

Table 2

Pearson's correlation of surveyed variables and the sum of crime prevention strategies in one's residence.

Variable		1	2	3	4	5	6
1. Number of Crime Prevention Strategies	*Pearson's r*						
	p-value	---					
2. Are the streets in your neighborhood well-lit at night?	*Pearson's r*	.012	—				
	p-value	.865	—				
3. Are pedestrians and cyclists using the streets in your neighborhood easily seen by residents from inside their homes?	*Pearson's r*	-.039	.257	—			
	p-value	.586	< .001	—			
4. When you walk around your neighborhood, do you see and talk to other people?	*Pearson's r*	.32	.166	.096	—		
	p-value	.654	.018	.179	—		
5. Is there a lot of crime in your neighborhood?	*Pearson's r*	.075	-.051	.115	.094	—	
	p-value	.286	.467	.106	.186	—	
6. Does crime make it unsafe to walk around your neighborhood during the day?	*Pearson's r*	.13	-0.18	.094	-.093	.317	—
	p-value	.065	0.01	.188	.191	< .001	—
7. Does crime make it unsafe to walk around your neighborhood at night?	*Pearson's r*	.104	-.239	.008	-.181	.54	.495
	p-value	.141	< .001	.916	.01	< .001	< .001

Discussion

We verified the patterns of residential crime prevention strategies in Vila Planalto. Heat Maps indicate that some crime prevention strategies taken by the residents are congruent with the geographical juxtaposition of urban resources and facilities. For example, areas with high access control were also places with fewer opportunities for natural surveillance. By the use of Multidimensional Scaling, we could visualize more robustly the patterns of use of certain crime prevention strategies, showing that some strategies are somehow more correlated with the use of another one. Further, we verified no correlation between the amount of crime prevention strategies in one's residence and the perception of safety in the neighborhood. It might be interesting, in future studies, to investigate the presence of variables such as (a) individual resources and income to invest in those strategies and (b) specificities of the crime prevention culture in the village (Gaio, 2006). However, we found that the perception of the neighborhood being well-lit was correlated with the perception of safety in walking during the night and day.

The present study helps to identify how individuals make decisions on crime prevention

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strategies and proposes holistic insights on how to understand modern crime prevention efforts by citizens. As a social contribution of this study, we helped to identify geographic locales where police officers could make efforts for crime prevention education actions in Vila Planalto, using. Thus, it would be possible to invest structurally and socially in environments that reduce opportunities and attractiveness for the occurrence of crimes, discouraging criminal behavior and stimulating the construction of support and bonding among the inhabitants of a given community. Further studies should include other important variables such as situational and dispositional fear of crime as a potential correlate with the use of crime prevention strategies (Costa, 2017; Gabriel & Greve, 2003).

Limitations

This study has some limitations that should be acknowledged. First, the data collection was conducted in only one neighborhood in Brazil, which may limit the generalizability of the findings to other contexts and cultures. Second, the second study relied on self-reported measures of perception of safety and crime, which may be subject to social desirability bias or recall bias. Third, the study did not control for potential confounding variables, such as socio-economic status, demographic characteristics, or personal experiences of victimization, which may influence the perception of safety and the use of crime prevention strategies. Fourth, the study did not examine the causal relationships between the perception of safety, the use of crime prevention strategies, and the occurrence of crime, which would require a longitudinal or experimental design. Therefore, the results should be interpreted with caution and further research is needed to address these limitations and to explore the complex interactions between the environment, the behavior, and the perception of the residents.

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