



Phenomenological Hermeneutical Method and Neutrosophic Cognitive Maps in the Causal Analysis of Transgressions against the Homeless

Alex Javier Peñafiel Palacios¹, Jesús Estupiñán Ricardo², Iyo Alexis Cruz Piza³ and Marcia Esther España Herrería⁴

¹ Universidad Regional Autónoma de los Andes (UNIANDES). Avenida Jorge Villegas. Babahoyo. Los Ríos. Ecuador Email: ub.c.derecho@uniandes.edu.ec

² Universidad Regional Autónoma de los Andes (UNIANDES). Avenida Jorge Villegas. Babahoyo. Los Ríos. Ecuador Email: ub.c.investigacion@uniandes.edu.ec

³ Universidad Regional Autónoma de los Andes (UNIANDES). Avenida Jorge Villegas. Babahoyo. Los Ríos. Ecuador Email: ub.iyocruz@uniandes.edu.ec

⁴ Universidad Regional Autónoma de los Andes (UNIANDES). Avenida Jorge Villegas. Babahoyo. Los Ríos. Ecuador Email: ub.marciaespania@uniandes.edu.ec

Abstract. The homeless are a social group that does not have a profession, job, basic rights, or a house to live in, and have been excluded by society. In Quito, Ecuador, especially in the center, it is common to see people living on the street without a roof or a dwelling to live in. They are referred to by society as the excluded population, marginalized, homeless, among other terms. Living on the street does not imply having to be a victim of aggression, but there are more demonstrations of this type of behavior every day. There are several organizations designed to help or improve the lifestyle of these people to mitigate this situation. Then, to contribute to the strengthening of the work of these institutions, the research objective of this research is to develop a cause-and-effect analysis of the crimes committed against the homeless, improving their services with knowledge, standards, and methods to be able to manage the problem, along with activities to guide the Homeless to contribute to the Good Living Plan. For the research development, a hermeneutical approach was applied and a cause-effect tree based on the neutrosophic cognitive maps was built.

Keywords: hermeneutic, neutrosophic cognitive maps, homeless, crime.

1. Previous knowledge

The homeless are a social group that does not have a profession, job, basic rights, or a house to live in, and have been excluded by society. In Quito, Ecuador, especially in the center, it is common to see people living on the street without a roof or a dwelling to live in. They are referred to by society as the excluded population, marginalized, homeless, among other terms. They are people without rights or basic services and above all, without interest on the part of society towards them. For this reason, this socially excluded group becomes ignored in political, economic, and social eyes [1-5].

On [1-14], it is considered that the most common causes of homelessness can be organized around the following groups:

- Materials (group economic variables including poverty)
- Affective (they group the variables related to the loss of social support and the breakdown of social networks)
- Personal (physical and mental illnesses, addictions, and loneliness are included in this category)
- Institutional (include the relationship of the person with all types of institutions)

This current situation has a critical panorama since the COVID-19 health emergency began, the number of people living on the streets increased. Due to the pandemic, there has been an increase in people living on the streets in Quito. They spend the night in places where they can take refuge. There is no exact number, however, the President of the Ecuadorian Red Cross exposes in [9] that in recent weeks 150 food kits have been delivered and of that number, 75% are 'new' inhabitants. He refers that it has been increased by 30 per day [9].

The increase in homelessness is not favorable. These are supposed to lead to an economic decrease since their contribution to society is null. This is endorsed because not having a stable job, a home, or basic rights such as food, health, water, etc., they are not constituted as citizens. So that is to say, they do not have economic rights towards a State and for the same reason, they are free from tax payment, a monthly retirement, or social security payment. In the eyes of the leaders, they do not contribute monetarily to the development of a country [1].

In addition, it can be said that it also indirectly affects the tourist or visual representation of (Quito). Because an image about the beggars as a presence that disturbs and offends the image of a "clean Quito" or a "21st Century Guayaquil", as shown in the main campaigns of the cities created by their respective mayors or municipalities. For a tourist, the vagabond as they are contemptuously known is an unwanted being of society or of the place they occupy [1].

This negative view influences the complex situation for the management of these people since prejudices turn citizens into criminals daily. Given mainly by the fact of committing actions against the physical and mental integrity of the homeless, motivated mainly by the wishes of discrimination. Currently agoraphobia, that is, hatred towards impoverished and vulnerable people is considered a hate crime [6, 8] and it takes place among the citizens of Ecuador. The intention of those who commit hate crimes is not only to direct a message of intolerance towards the immediate person on whom it acts but above all the group that person belongs to [6].

Living on the street does not imply having to be a victim of aggression, but there are more demonstrations of this type of behavior every day. Sadly, in most cases, victims do not report for various reasons: because they believe that it will not help, they are afraid of possible reprisals or, in the case of foreigners, who are in an irregular or illegal situation, for fear of being expelled [2-4, 8, 11]. According to the literature consulted, it has been observed worldwide that young people mostly tend to carry out such violent acts, especially on men over 45 years of age and young women who live on the street [6].

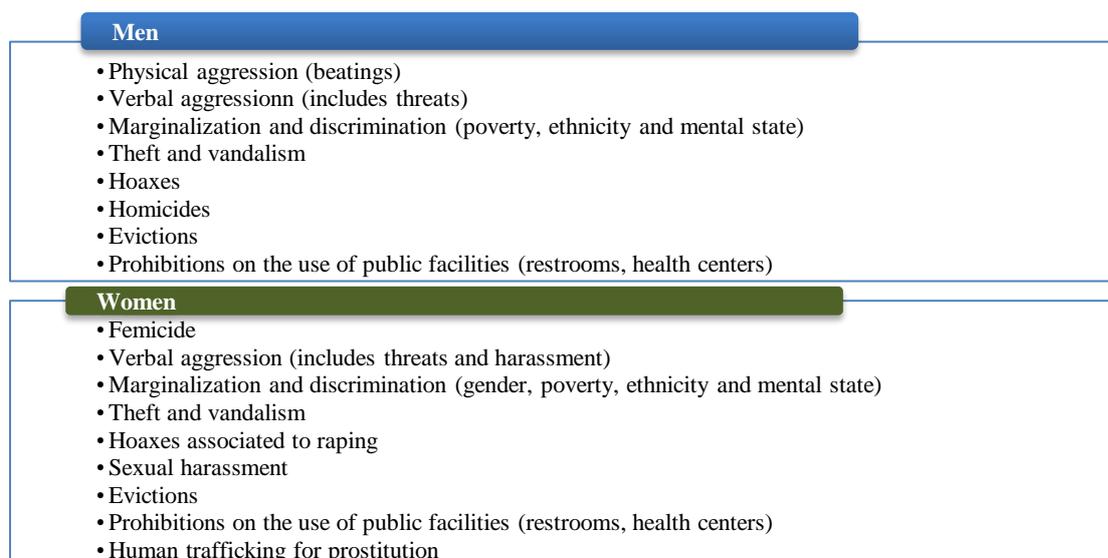


Figure 1: Main crimes committed against homeless people. Source [1-19].

There are several organizations designed to help or improve the lifestyle of these people to mitigate this situation [1]. Therefore, it is necessary to contribute to the strengthening of the work of these institutions, government and NGOs. Therefore, the *objective of the investigation* is to elaborate a cause-effect analysis of the crimes committed against the homeless, improving their services with knowledge, norms, and methods to be able to manage the problem, together with activities to guide the Homeless to contribute to Good Living Plan.

The analysis of the subject will be treated through a phenomenological hermeneutical approach since it is necessary to analyze different points of view. The results will be processed with the help of the neutrosophic cognitive maps (NCM), coming from the theory of Neutrosophy proposed by Florentin Smarandache for the treatment of neutralities, which has been proven by the possibility of enriching the analysis and converting linguistic terms into quantitative variables [15, 20-35]. The NCM according to [13] is a way of representing knowledge by means of a graph, the strength between the relationship can be measured, so it is used in social studies [15, 28, 36-42].

For the development of the research, the following *specific objectives* must be executed:

1. Analyze the problem using a hermeneutical process approach
2. Build the cause-effect tree to trace the phenomenon
3. Strategies from various perspectives
4. Partial conclusions

2. Methods

The phenomenological hermeneutical method is characterized by a high level of subjectivity and therefore it can be said that there is uncertainty. In other words, hermeneutics tends to qualitative interpretation, which leads to subjectivity in knowledge, and although the scientific method owes its roots to hermeneutics, it seems a contrasting form of knowledge in which hermeneutics no longer has a place. That is why its fusion with Neutrosophy and the MCN is convenient. For a better understanding of data processing with MCNs, the following is exposed:

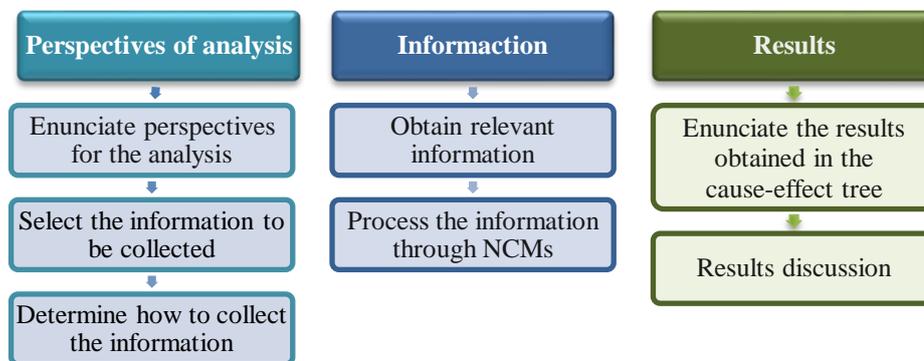


Figure 2: Process approach diagram for the analysis of the problem posed.

Questionnaires: questionnaires were used depending on the group of people to be interviewed. A dynamic environment was presented for the interviews, that is, topics for the questions were elaborated a priori, but as progress was made, the plan could be modified, but never leaving the topic. Below is exposed:

- Socio-demographic information: sex, date of birth, nationality, education, family, children.
- Information on elements related to the state of physical, mental, and psychological health both from the perspective of the homeless person himself and from that of the interviewer.
- Information related to life as a homeless person: time, causes, main factors that affect life, crimes committed against him or her (type, when, where, witnesses, frequency, sex, and estimated age of the aggressor), consequences.
- Information on the attitude after the assault (sought help, reported the events, hospital report)

Starting from the previous elements, in this particular work, the use of Neutrosophic Cognitive Maps (NCMs) is proposed considering the advantages that this technique offers compared to other soft-computing techniques, in terms of interpretability, scalability, aggregation of knowledge, dynamism, and its ability to represent feedback and indeterminacy relationships [34]. NCMs were introduced by [43] in 2003. NCMs are an integration of the Fuzzy Cognitive Maps (FCMs) introduced by Kosko in 1986 and the Neutrosophic Sets (NSs) introduced by Smarandache in 1995 [20]. This technique overcomes the inability of traditional FCMs to represent indeterminacy. The inclusion of indeterminacy establishes that neutrality and ignorance are also forms of uncertainty. [20] Exposes that FCMs constitute a technique that has received increasing attention due to its possibilities for representing causality. The following is a set of definitions necessary to work with NCMs. First, let formally expose the original definition of neutrosophic logic as it is shown in [30].

Definition 1. [27] Let $N = \{(T, I, F): T, I, F \in [0, 1]\}$ be a *neutrosophic set of evaluation*. $v: P \rightarrow N$ is a mapping of a group of propositional formulas into N , ie, each sentence $p \in P$ is associated to a value in N , as it is exposed in Equation 1, meaning that p is $T\%$ true, $I\%$ indeterminate, and $F\%$ false.

$$v(p) = (T, I, F) \quad (1)$$

Hence, the neutrosophic logic is a generalization of fuzzy logic, based on the concept of neutrosophy according to [29, 33].

Definition 2. (See [27, 28]) Let K be the ring of real numbers. The ring generated by $K \cup I$ is called a *neutrosophic ring* if it involves the indeterminacy factor in it, where I satisfies $I^2 = I$, $I + I = 2I$ and in general, $I + I + \dots + I = nI$, if $k \in K$, then $kI = kI$, $0I = 0$. The neutrosophic ring is denoted by $K(I)$, which is generated by $K \cup I$, ie, $K(I) = \langle K \cup I \rangle$, where $\langle K \cup I \rangle$ denotes the ring generated by K and I .

Definition 3. A *neutrosophic matrix* is a matrix $A = [a_{ij}]$ $i, j = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$; $m, n \geq 1$, such that each $a_{ij} \in K(I)$, where $K(I)$ is a neutrosophic ring, see [15].

Let us observe that an element of the matrix may have the form $a + bI$, where “a” and “b” are real numbers, whereas I is the indeterminacy factor. The usual operations of neutrosophic matrices can be extended from the classical matrix operations.

$$\text{For example, } \begin{pmatrix} -1 & I & 5I \\ I & 4 & 7 \end{pmatrix} \begin{pmatrix} I & 9I & 6 \\ 0 & I & 0 \\ -4 & 7 & 5 \end{pmatrix} = \begin{pmatrix} -21I & 27I & -6 + 25I \\ -28 + I & 49 + 13I & 35 + 6I \end{pmatrix}$$

Additionally, a neutrosophic graph is a graph that has at least one indeterminate edge or one indeterminate node [25, 30]. The neutrosophic adjacency matrix is an extension of the adjacency matrix in classical graph theory. $a_{ij} = 0$ means nodes i and j are not connected, $a_{ij} = 1$ means that these nodes are connected and $a_{ij} = I$, which means the connection is indeterminate (unknown whether it is or not). Fuzzy set theory does not use such notions.

On the other hand, if the indetermination is introduced in a cognitive map as it is referred to in [24], then this cognitive map is called a neutrosophic cognitive map, which is especially useful in the representation of causal knowledge [23, 33]. It is formally described in Definition 4.

Definition 4. A Neutrosophic Cognitive Map (NCM) is a neutrosophic directed graph with concepts like policies, events, among others, as nodes and causalities or indeterminacies as edges. It represents the causal relationship between concepts.

The measures described below are used in the proposed model, they are based on the absolute values of the adjacency matrix [24]:

- Outdegree ($od(v_i)$) is the sum of the row elements in the neutrosophic adjacency matrix. It reflects the strength of the outgoing relationships (c_{ij}) of the variable:

$$od(v_i) = \sum_{j=1}^n c_{ij} \tag{2}$$

- Indegree ($id(v_i)$) is the sum of the column elements. It reflects the strength of relations (c_{ij}) outgoing from the variable.

$$id(v_i) = \sum_{j=1}^n c_{ji} \tag{3}$$

- Total centrality (total degree $td(v_i)$), is the sum of the indegree and the outdegree of the variable.

$$td(v_i) = od(v_i) + id(v_i) \tag{4}$$

The variables are classified according to the following criteria, see [44]:

- The transmitting variables are those with $od(v_j) > 0$ and $id(v_i) = 0$.
- The receiving variables are those with $od(v_j) = 0$ and $id(v_i) > 0$.
- Ordinary variables satisfy both $od(v_j) \neq 0$ and $id(v_i) \neq 0$.

The static analysis is applied using the adjacency matrix, taking into consideration the absolute value of the weights [25]. Static analysis in Neutrosophic Cognitive Maps (NCM), see [23], initially contains the neutrosophic number of the form $(a + bI)$, where $I = \text{indetermination}$ [22]. It requires a process of de-neutrosophication as proposed in [24], where $I \in [0, 1]$ and it is replaced by their values maximum and minimum.

Finally, we work with the average of the extreme values, which is calculated using Equation 5, which is useful to obtain a single value as it is referred to in [21]. This value contributes to the identification of the characteristics to be attended, according to the factors obtained, for our case study.

$$\lambda([a_1, a_2]) = \frac{a_1 + a_2}{2} \tag{5}$$

Then,

$$A > B \Leftrightarrow \frac{a_1 + a_2}{2} > \frac{b_1 + b_2}{2} \tag{6}$$

3. Results

3.1 Analysis perspectives

We worked with four perspectives based on the identification of the stakeholders of the social phenomenon to be analyzed below:

Legend:

HP: homeless people

Brigades: support brigades working on the streets to help the homeless

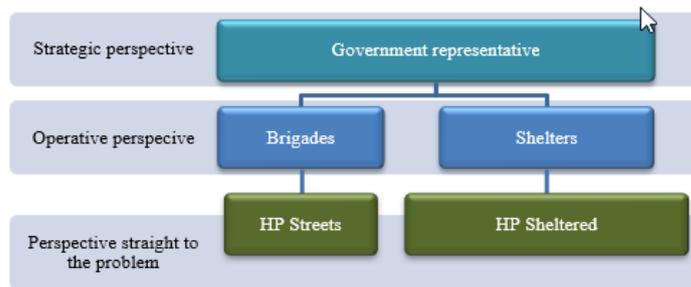


Figure 3: Analysis perspectives.

3.2 Information

It was decided to work with a 95% confidence (2σ) and $p = q$, the error for the whole sample being $\pm 5.95\%$. The following criteria conditioned the sampling of the population:

1. Be or have been homeless for at least four months
2. Equal the number of men and women to interview and that 50% of them were immigrants

From the population to be interviewed, a sample of 150 people in a shelter was chosen, from them, in addition to the criteria already established, it was possible to determine that:

- 23% had a disability
- Average age 47 years
- Average time without a home: 8 months
- 60% had only primary studies, 35% secondary and 5% graduated from a technician in their country of origin (in the latter case they were all immigrants)
- 28% had established children of legal age with whom they have no relationship
- 31% presented alcoholism and drug addiction problems.
- 100% of the immigrants came from Venezuela from a low social class.
- Most frequently detected effects of violence:
 - I. Femicides / Homicides
 - II. Verbal assault (includes threats and harassment)
 - III. Marginalization and discrimination (gender, poverty, ethnicity, and mental state)
 - IV. Theft and vandalism
 - V. Hoaxes linked to rapes
 - VI. sexual harassment
 - VII. Evictions
 - VIII. Prohibitions on the use of public facilities (restrooms, health center)
 - IX. Trafficking in persons for prostitution
- Regarding the causes of your condition:
 - Poverty
 - State of crisis due to the pandemic (living in a lower class but with minimal sustenance due to services)
 - Drug and alcohol use
 - Break-up of important relationships (family, friends, interpersonal) and not having financial aid from the government
 - Lack of education
 - Having been subjected to domestic violence
 - Immigration

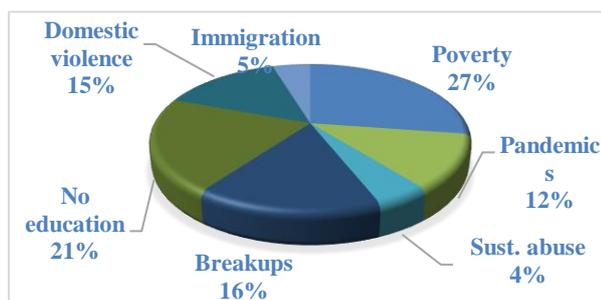


Figure 4: Main causes of the condition of Homeless Persons detected in the interviews.

Analysis of the causal interrelation of the strategic perspective:

	Poverty	Crisis	Cons	Relat.	No ed	Viol	Immig.	id	od	td	Order
Poverty	0	0.5 + I	1	0.6 + I	1	I	0.5	1	0.75833	1.75833	1
Crisis	1	0	1	1	1	I	0	0.7917	0.75	1.54167	5
Cons	1	1	0	1	1	1	0	0.8333	0.83333	1.66667	2
Relat	1	0	1	0	1	1	0.7	0.8	0.78333	1.58333	4
No ed	1	1	0	1	0	1	0	0.8333	0.66667	1.5	6
Viol	1	1	1	0	1	0	1	0.8333	0.83333	1.66667	3
Immig	1	1	1	1	0	1	0	0.3667	0.83333	1.2	7

Table 1: Adjacency matrix and "Government representatives" processing

Analysis of the causal interrelation of the operational perspective:

	Poverty	Crisis	Cons	Relat.	No ed	Viol	Immig.	id	od	td	Order
Poverty	0	1	1	1	1	1	1	0.7894	1.0526	1.8421	2
Crisis	1	0	1	1	1	1	0	0.7192	0.8772	1.5965	5
Cons	0	0.7	0	0.8	1	1	0	1.1053	0.7368	1.8421	3
Relat	1	0	1	0	1	1	I	0.8421	0.8772	1.7193	4
No ed	0.6	0.4	0.7	1	0	1	I	0.9649	0.7368	1.7017	5
Viol	0.9	1	1	0	1	0	1	1	0.8596	1.8596	1
Immig	1	1	0.9	I	I	0.7	0	0.5263	0.8071	1.3333	7

Table 2: Adjacency matrix and "Brigades" processing

	Poverty	Crisis	Cons	Relat.	No ed	Viol	Immig.	id	od	td	Order
Poverty	0	1	1	1	1	1	1	0.65458	1	1.6543	4
Crisis	1	0	1	1	1	1	0	0.6282	0.8333	1.4615	6
Cons	0	0.5648	0	0.6994	1	1	0	1.0959	0.6816	1.7775	2
Relat	1	0	0.9238	0	1	1	0.7 + I	0.7813	0.879	1.6603	3
No ed	0.3592	0.2045	0.8257	0.9886	0	1	0	0.9167	0.563	1.4797	5
Viol	0.8683	1	1	0	1	0	1	1	0.8114	1.8114	1
Immig	0.7	1	1	I	I	1	0	0.475	0.7833	1.2583	7

Table 3: Adjacency matrix and "Shelter" processing

Analysis of the causal interrelation from the direct perspective to the problem:

	Poverty	Crisis	Cons	Relat.	No ed	Viol	Immig.	id	od	td	Order
Poverty	0	1	1	1	1	1	1	1	1	2	3
Crisis	1	0	1	1	1	1	1	1,1667	1,1667	2.3333	1
Cons	1	1	0	1	1	1	0	1,1667	1	2.1667	2
Relat	1	1	1	0	1	1	0	0.6667	0.8333	1.5	6
No ed	1	1	1	1	0	1	1	0.8333	1	1.8333	4
Viol	1	1	1	0	1	0	1	0.9167	0.8333	1.75	5
Immig	1	1	1	0	0	I	0	0.6667	0.5833	1.25	7

Table 4: Adjacency matrix and "HP Street" processing

	Poverty	Crisis	Cons	Relat.	No ed	Viol	Immig.	id	od	td	Order
Poverty	0	1	1	1	1	1	1	1	1	2	3
Crisis	1	0	1	1	1	1	1	1,1667	1,1667	2.3333	1
Cons	1	1	0	1	1	1	0	1,1667	1	2.1667	2
Relat	1	1	1	0	1	1	0	1	0.8333	1.8333	4
No ed	1	1	1	1	0	1	1	0.8333	1	1.8333	5
Viol	1	1	1	1	1	0	1	0.8333	1	1.8333	6
Immig	1	1	1	1	0	0	0	0.6667	0.6667	1.3333	7

Table 5: Adjacency matrix and "HP Sheltered" processing

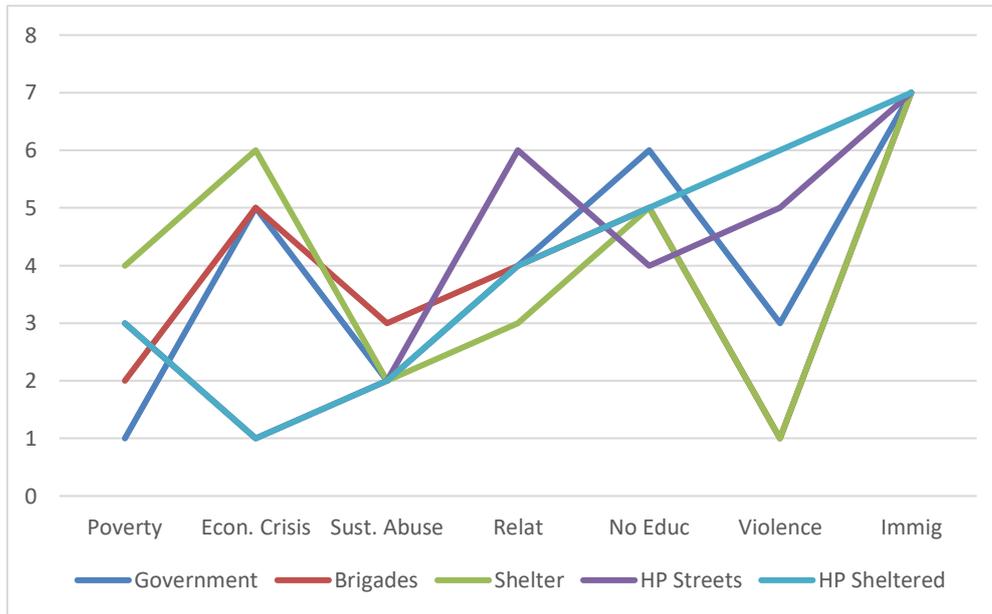


Figure 5: Summary of td scores.

3.3 Results

The results obtained are stated in the causes-effect tree and brainstorming will be submitted to obtain different perspectives in the search for solutions and possible strategies.

Strategic and Operative solutions	<ol style="list-style-type: none"> 1. Action campaigns in the community and education centers to create awareness about the abuse of drugs and alcohol, domestic violence, and the need to take care of an elderly. 2. Insert social workers and consultants to prevent students from deserting. 3. Increase the amount of workers, material and financial resources in the shelters and support brigades in zones with bigger concentration of Homeless people.. 4. Use the government resources to protect small business.
Effects of being Homeless	<ol style="list-style-type: none"> 1. Femicides/homicides 2. Verbal aggression (includes threats and) 3. Marginalization and discrimination (gender, poverty, ethnicity mental estate) 4. Theft and vandalism 5. Hoaxes linked to rapes 6. Prohibitions on the use of public facilities (restrooms, health center) 7. Trafficking people for prostitution

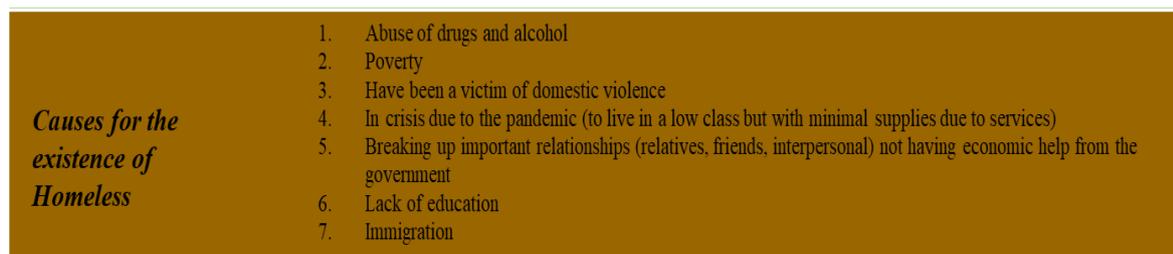


Figure 6: Causes-effect Tree.

Conclusions

- Even though homeless people are part of the public space of a city, they suffer from aggressions caused by other citizens. According to the data, all the homeless people interviewed have suffered aggression, humiliation, and intimidation motivated by the intolerance and prejudice of their aggressors towards their situation of extreme social exclusion. Sleeping and living on the street have a component of structural violence, which is further aggravated by the direct violence to which these people are subjected.
- From the bibliographic point of view, we found that it is an international problem, increased by the negative impact of the economic crisis caused by COVID-19.
- Homeless people are mostly exposed to abuse, violence, and social rejection. They are repressed mainly by young people. In addition, it was evidenced that women are an easy target for human trafficking and sexual abuse. It is currently a crime within the Penal Code, but a complaint is required, a situation that generally does not occur since most victims are ignored due to their "indigent" status.
- Not all homeless have this condition due to poverty and substance abuse, it was determined that domestic violence and break-up relationships with the elderly are also considered important causes. As well as it was determined that the small businesses affected by the economic crisis were forced to become homeless mainly due to their condition as low-income Venezuelan immigrants. Due to the inability to meet the expenses, they experienced rejection and had no choice other than to go to the streets.
- The strategic level made up of the city government has a very different vision of the phenomenon with respect to the rest of the levels. Perhaps this is the cause of the creation of ineffective strategies. It is recommended that these personnel be part of the help so that they know the facts reliably.
- It is considered at a strategic and operational level that campaigns should be implemented to mitigate these issues with the full involvement of the centers to help the homeless and the educational ones. All with the aim of prevention and reactivity to the problem at the same time. The involvement of all social layers is needed as well as the help of the government and Non-Governmental Organizations.

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