



Neutrosophic cognitive map for the analysis of substances subject to control

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Abstract. This study addresses the central problem of analyzing the commercialization of controlled substances using a neutrosophic cognitive map approach, a tool that has been little explored in this context. The need to investigate this phenomenon lies in the increasing complexity and ambiguity of controlled substances markets, where factors such as regulation, consumer behavior, government policies, and the evolution of supply and demand, generate a highly uncertain and dynamic environment. Despite previous research in the field of commercialization of these substances, traditional approaches fail to capture the interaction and combined effects of the multiple elements that influence the market. This study fills that gap by integrating the concept of neutrosophic to more accurately represent the relationships between these factors, taking into account the inherent imprecision in data and human behavior. The methodology used in this work is based on the construction of a neutrosophic cognitive map, which not only organizes and visualizes the interactions between the different elements of the commercialization process but also allows for modeling the uncertainty and nonlinear interactions between them. The results reveal that this approach offers a richer and more dynamic understanding of the controlled substances market, highlighting the key factors that contribute to fluctuating supply and demand and providing a useful tool for formulating more effective policies. The contribution of the study is significant, as it not only offers a new theoretical perspective on the analysis of complex markets but also provides a methodology that can be applied to other fields facing problems of uncertainty, such as the regulation of other controlled products or decision-making in highly complex contexts.

Keywords: Neutrosophic Adjacency Matrix, Neutrosophic Cognitive Mapping, Neutrosophic Modeling, Decision Making in Complex Contexts; Cognitive Analysis; Drug Trafficking.

1. Introduction

The history of substance use dates back to ancient times, initially linked to mystical and religious practices. Over the centuries, various cultures, such as the Sumerian, Chinese, Indian, Greek and Roman, used substances such as poppies and marijuana in religious and medicinal contexts. However, today, the marketing of controlled substances has evolved to become a global problem, associated with organized crime and related crimes such as homicide and money laundering. [1]

In Ecuador, social and cultural changes, together with economic factors, have led to an increase in the commercialization of these substances, especially in impoverished areas and among young people. Organized crime deploys complex structures that favor micro-trafficking and illicit association. The definition of controlled substances addresses the legal prohibition or medical and pharmaceutical restriction on their commercialization. Various entities, such as the World Health Organization and the National Agency for Regulation, Control and Health Surveillance, provide perspectives on these substances.

At the international level, the fight against trafficking and consumption of prohibited substances involves organizations such as the UN and the OAS, highlighting bilateral and multilateral cooperation. In Guayaquil, drug-related problems affect the quality of life, generating insecurity and violence [2], particularly among young people.

Statistics show a worrying increase in the consumption of controlled substances in Guayaquil since January 2021. Despite government efforts and international cooperation, the magnitude of consumption persists, especially in marginalized areas of the city.

The concept of controlled substances encompasses addictive narcotics and psychotropic drugs that directly affect mental and intellectual activities by reducing the activity of the nervous centers. When consumed, these substances cause psychological dependence, sleep, narcosis, numbness, loss of consciousness and anxiety, which leads to accelerated deterioration of moral limitations and loss of motor skills. They are considered high-risk and are regulated by governments to prevent their cultivation [3], illegal sale and consumption.

The classification of narcotic substances, according to the National Agency for Regulation, Control and Health Surveillance, includes narcotics, psychotropics, chemical precursors and specific chemical substances. From the point of view of their chemical structure, they are divided into depressants, stimulants, hallucinogens, opioids, inhalants and cannabis.

Depressants act as sedatives, weakening nerve functions, and include the use of alcoholic beverages. Stimulants accelerate activity in the central nervous system, generating alertness and energy, as in the case of cocaine and amphetamines. Hallucinogens alter the perception of reality, time, and space, inducing fictitious visual and auditory experiences. Opioids include illicit heroin, synthetic opioids, and prescription painkillers. Inhalants are absorbed by inhalation and enter the bloodstream and are found in household products such as paints and adhesives. Finally, cannabis can cause mental disorders, including psychosis. [4]

The sale of controlled substances, especially narcotics, is considered a wilful crime. This crime requires that individuals know the availability of the drug and a subjective element, which is the intention to sell narcotics, which is why it is linked to illicit drug trafficking activities.

The marketing of these substances influences various contexts, sometimes driven by consumption needs or poverty conditions. Additionally, the participation of minors in the criminal chain is highlighted [5], contributing to the disproportionate increase in associated criminal activities. [6]

It is important to note that illicit drug trafficking involves several stages, from the manufacturing of raw materials to final distribution. The marketing of controlled substances represents the last phase of this illicit activity, which allows the drug to reach the final consumer. This process includes preparation, transportation, storage and distribution before reaching the marketing stage.

Microtrafficking refers to the problem related to the sale of small quantities of narcotics or controlled substances. It involves the commercialization of drugs on a small scale, with minimal seizures and concealment in distribution for direct and immediate consumption. This phenomenon poses an important challenge with social, political, economic and security implications, since it constitutes a threat to Ecuador due to its systematic expansion at the level of consumption and its commercial appeal in developing countries.

Citizen security refers to the guarantee of quality of life and human dignity, based on freedom as a fundamental right and access to social opportunities in globalized markets. This concept is based on public trust in the power of the State, which, respecting the principle of legality, aims to protect citizens from social dangers. Citizen security is also linked to the fight against poverty and drug addiction, since high levels of these issues indicate insecurity.

The Constitution establishes that it is the primary duty of the State to guarantee peace, social security, progress and development of society in the various social and economic aspects. Citizen security becomes essential to combat the increase in crime and protect national heritage, as it is a key element to maintain the stability of the State. Therefore, the present study aims to comprehensively analyze the

phenomenon of the increase in the commercialization of controlled substances in Guayaquil, using an approach based on cognitive maps to merge information from various sources, with the purpose of providing a deep and systematic understanding of the problem.

2. Related work

Neutrosophic cognitive maps

Based on the above 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, knowledge aggregation, dynamism and its capacity to represent feedback and indeterminacy relationships [7].

NCMs were introduced in 2003. NCMs are an integration of Fuzzy Cognitive Maps (FCMs) introduced by Kosko in 1986 and Neutrosophic Sets (NSs) introduced by Smarandache in 1995. 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. It shows that FCMs constitute a technique that has received increasing attention due to its possibilities to represent causality. A set of definitions necessary to work with NCMs is presented below. First, let us formally state the original definition of neutrosophic logic as shown in [8].

Definition 1: Let $N = \{(T, I, F): T, I, F \in [0,1]\}$

Let C be a neutrosophic set of evaluations. $v: P \rightarrow N$ is a mapping of a set of propositional formulas to N , i.e. each sentence $p \in P$ is associated with a value in N , as given in Equation 1, meaning that p is $T\%$ true, $I\%$ indeterminate and $F\%$ false [9].

$$v(p) = (T, I, F) \tag{1}$$

Therefore, neutrosophic logic is a generalization of fuzzy logic, based on the concept of neutrosophy [10, 11, 12].

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

Definition 3: A neutrosophic matrix is a matrix $A = [a_{ij}]$ where $i, j = 1, 2, \dots, m$ 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.

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

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

Furthermore, a neutrosophic graph is a graph that has at least one indeterminate edge or one indeterminate node. The neutrosophic adjacency matrix is an extension of the adjacency matrix of classical graph theory. $a_{ij} = 0$ means that nodes i and j are not connected, $a_{ij} = 1$ means that these nodes are connected and $a_{ij} = I$, which means that the connection is indeterminate (it is unknown whether it is connected or not). Fuzzy set theory does not use such notions [13,14,15].

On the other hand, if indeterminacy is introduced into a cognitive map as it is called, then this cognitive map is called a neutrosophic cognitive map, which is especially useful in the representation of causal knowledge. It is formally defined in Definition 4.

Definition 4. A neutrosophic cognitive map (NCM) is a neutrosophic directed graph with concepts such as policies and 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:

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

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

- The in-degree ($id(v_i)$) is the sum of the elements in the column. It reflects the strength of the relationships (c_{ji}) that come out of the variable.

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

- The total centrality (total degree $td(v_i)$), is the sum of the in-degree and the out-degree of the variable.

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

Static analysis is applied using the adjacency matrix, taking into consideration the absolute value of the weights. Static analysis in Neutrosophic Cognitive Maps (NCM), see, initially contains the neutrosophic number of the form (a, I, b) , where I = indeterminacy). It requires a $a + bI$ denutrosophication process as proposed in [1], where $I \in [0, 1]$ and are replaced by their maximum and minimum values.

Finally, the average of the extreme values is calculated using Equation 5, which is useful for obtaining a single value. This value contributes to the identification of the characteristics to be addressed, according to the factors obtained, for our case study.

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

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

3. Methods

This study adopted a qualitative-quantitative approach, applying statistical tools and qualitative methods, including cognitive maps [7], to characterize the phenomenon. A non-experimental grounded theory design was used, with a descriptive and analytical-explanatory scope.

The theoretical methods included analytical-synthetic, inductive-deductive and systems approaches. At the empirical level, documentary analysis, interviews and surveys were used. Additionally, cognitive maps were implemented as a tool to merge information from various sources [16, 8], thus providing a comprehensive understanding of the problem of the increase in the commercialization of controlled substances in Guayaquil. The population consisted of 5 lawyers with a master's degree in human rights and more than 5 years of experience, and 10 citizens between 18 and 60 years of age from neighborhoods with a high incidence of micro-trafficking.

4. Results

In the analysis of the surveys applied to the citizens of Guayaquil regarding the commercialization of controlled substances, the following significant results were obtained:

- Awareness of the problem: 100% of respondents said they were aware of the marketing of controlled substances, which indicates that it is a widely recognized problem in Guayaquil society. However, it is worth noting that not everyone reports it, which has contributed to the surprising expansion of the phenomenon.
- Presence in Sectors: 100% indicated that the commercialization of these substances is present in their respective sectors, suggesting a widespread incidence in several neighborhoods of Guayaquil.

- Substances marketed: 40% indicated that in their sectors the main market is “H” (heroin), followed by 20% cocaine, 20% crack and 20% marijuana. The high prevalence of “H” is notable, associated with its high addictive potential and dangerous composition.
- Causes of the increase: 50% attributed the increase in sales to organized crime, 20% to poverty, another 20% to family problems and 10% to social deterioration. This reflects the perception of Guayaquil as a city affected by organized crime in conflictive neighborhoods.
- Responsibility for the increase: 50% believe that the responsibility lies with the family, 40% with the administration of justice and 10% with society. This suggests the perception that the family plays a crucial role and its deterioration contributes to the problem.
- Impact on Citizen Security: 100% believe that the sale of controlled substances affects citizen security in Guayaquil, thus linking this phenomenon not only to organized crime but also to other crimes, contributing to the city being considered one of the most violent in Ecuador. These results underline the urgency of addressing the marketing of controlled substances in Guayaquil and highlight the need for action at both the family level and in the justice system to counteract the impacts on public safety.

The investigation included interviews with lawyers specializing in human rights to learn about the situation regarding the sale of controlled substances in Guayaquil. The most relevant findings are the following:

- Problem definition: Respondents agree that the marketing of controlled substances refers to the small-scale sale of these substances for direct consumption. This criminal phenomenon is perceived as a rapidly growing problem that has negatively affected human development over time.
- Current legislation: The interviewees consider that the Ecuadorian government has made adequate efforts to punish this crime. They highlight laws such as the Organic Law for the Comprehensive Prevention of the Socioeconomic Phenomenon of Drugs and the Regulation and Control of the Consumption of Substances Classified as Subject to Control, as well as article 220 of the COIP, which establishes the quantities of possession of these substances.
- Impact and Associated Crimes: The marketing of controlled substances is considered a profound social problem that leads to crimes such as robbery, rape, theft, organized crime, conspiracy, corruption, etc. Additionally, it is perceived as a serious crime that threatens people's health and peace of mind.
- Violated rights: Several rights have been identified as violated, such as the right to health, criminal justice, non-discrimination, the right to childhood and especially the right to public safety. Society stigmatizes consumers, affecting their integration.
- Causes of the increase: The interviews highlight underlying causes such as the increase in organized crime, lack of job opportunities due to population growth in Guayaquil, poverty, lack of education and family disintegration.
- Suggestions for prevention: It is suggested that the problem be recognized in a comprehensive manner and that policies be reviewed so that prevention campaigns go beyond the dissemination of information. In addition, it is recommended that unemployment be addressed, that COIP sanctions be modified to prevent criminals from hiding behind consumption, and that more in-depth campaigns be carried out.

By addressing these aspects, a holistic view of the commercialization of controlled substances in Guayaquil can be obtained, providing the basis for more informed and effective strategies and policies.

Once the status of the elements under analysis has been examined, potential factors are extracted through the process approach. To do this, the factors that influence the process approach of the commercialization of controlled substances in Guayaquil are analyzed .

Potential factors through the process approach.

Situation I: Marketing of controlled substances in Guayaquil (responsibility of society).

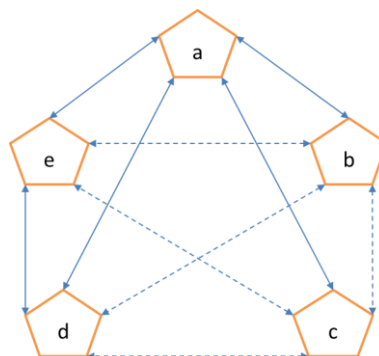
- A. Organized crime
- B. Socioeconomic factors
- C. Citizen awareness
- D. Citizen perception
- E. Barriers to reporting

Situation II: Marketing of controlled substances in Guayaquil (responsibility of local authorities)

- F. Laws and regulations
- G. Security Statistics
- H. Government actions
- I. Communication
- J. Opinions on the causes

By analyzing the negative criteria obtained from the information extraction, it was decided to evaluate through the NCMs method which strategies have the potential to mitigate the negative effects. These factors, called elements, are denoted with the following code (a, b, c, d, e) for Situation I (Figure 1) and (f, g, h, i, j) for Situation II (Figure 2), following the previous order in the table. The group of experts evaluates the causal relationships between each of the aforementioned elements evaluated in surveys and interviews. An adjacency matrix and the graph that represents it were obtained.

Situation I:



deneutrosophicized adjacency matrix and the means of the corresponding extreme values for the NCM.

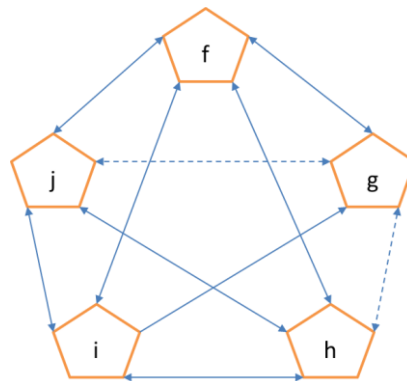
$$\text{my} = \begin{bmatrix} 0 & 1 & 0.7 & 0.8 & 1 \\ 1 & 0 & 0.5 & 0.5 & 0.5 \\ 0.6 & 0.5 & 0 & 0.5 & 0.5 \\ 0.9 & 0.5 & 0.5 & 0 & 0.8 \\ 1 & 0.5 & 0.5 & 0.2 & 0 \end{bmatrix} \quad \text{N(E)} = \begin{bmatrix} 0 & 1 & 0.7 & 0.8 & 1 \\ 1 & 0 & 0.5 & 0.5 & 0.5 \\ 0.6 & 0.5 & 0 & 0.5 & 0.5 \\ 0.9 & 0.5 & 0.5 & 0 & 0.8 \\ 1 & 0.5 & 0.5 & 0.2 & 0 \end{bmatrix} \quad \begin{array}{l} \text{td .} \\ \text{to } 1.5217 \\ \text{b } 1.0870 \\ \text{do } 0.9348 \\ \text{d } 1.0217 \\ \text{my } 1.0870 \end{array}$$

The following partial conclusions can be drawn from the above:

- When A is activated, all other nodes are activated, that is, the state of crime levels in society influences the other identified vertices, so it has a direct influence due to the causal relationship with the indices (if A increases, then B, C, D and E increase in the same way as A).
- The relationships with A and the rest of the nodes are bidirectional, confirming the causal relationship in both directions and magnitude visualized.
- A strong relationship of indeterminacy is observed in B with A, C, D and E bidimensionally.
Result: the order of importance of the factors will be as follows: $A > B > E > D > C$.

Priority factor to analyze: Mitigate the potential impacts of organized crime on the marketing of controlled substances in Guayaquil.

Situation II:



deneutrosophic adjacency matrix and the means of the corresponding extreme values of the NCM.

$$my = \begin{bmatrix} 0 & 0.2 & 0.8 & 0.9 & 0.3 \\ 0.3 & 0 & 0.5 & 0 & 0.5 \\ 1 & 0.5 & 0 & 0.9 & 0.7 \\ 0.8 & 1 & 0.6 & 0 & 0.6 \\ 1 & 0.5 & 1 & 0.2 & 0 \end{bmatrix} \quad N(E) = \begin{bmatrix} 0 & 0.2 & 0.8 & 0.9 & 0.3 \\ 0.3 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0.9 & 0.7 \\ 0.8 & 1 & 0.6 & 0 & 0.6 \\ 1 & 1 & 1 & 0.2 & 0 \end{bmatrix}$$

	td .
F	1.1522
gram	0.7609
I	1.3043
Yo	1.0870
I	1.0435

The following partial conclusions can be drawn from the above:

- When H is activated, all other nodes are activated, meaning that government actions aimed at mitigating crime in society can contribute to a calm state of opinions about the cause. This makes all other problems identified at the other vertices have a direct relationship with node H, and the solution at this node positively affects the others.
- The relationships with H and the other nodes are bidirectional, confirming the causal relationship in both directions and magnitude, with a level of indeterminacy between the HG nodes.
- There is an indeterminate relationship between GH and GJ. In addition, a unidirectional relationship is observed from I to G.

Result: the order of importance of the factors will be as follows: $H > F > I > J > G$.

Priority factor to analyze: Implement governmental and legal actions that contribute to mitigating the impact of the commercialization of controlled substances in Guayaquil.

INTEGRATED STRATEGIES FOR THE SITUATION

Therefore, the information obtained through cognitive analysis allows for improving the effectiveness of the actions undertaken by local authorities in the prevention and control of the commercialization of controlled substances in Guayaquil. Table 1 presents the proposed strategies (see Table 1) and a university project to support community integration in the reduction of the commercialization of substances in vulnerable communities.

Table 1: Strategies to strengthen prevention and control of the marketing of controlled substances in Guayaquil.
Source: Prepared by the authors.

No.	Strategies	Action points	Scope
1.	Development of personalized preventive strategies.	Demographic profile analysis.	Use demographic information to tailor preventive strategies to specific groups. Identify particular needs in areas with higher prevalence
		Differentiated educational programs.	Create preventive education programs adapted to age and socioeconomic situation. Incorporate specific approaches to address the challenges identified in each sector.
2.	Implementation of awareness campaigns	Using visual data.	Create visual campaigns based on cognitive maps to raise awareness in the community. Highlight critical areas and negative impacts of marketing.
		Local testimonies and experiences.	Use resident testimonies to convey the reality of the problem. Generate empathy and awareness about the consequences of commercialization.
3.	Strengthening citizen security	Coordination with security forces.	Establish effective collaboration protocols between local police and other security forces. Facilitate communication for a rapid and coordinated response.
		Surveillance at strategic points.	Implement surveillance systems in areas identified as critical. Use technology, such as security cameras, to monitor suspicious activity.
4.	Economic and employment strategies.	Job creation programs.	Develop programs that address unemployment rates in critical sectors. Create legitimate economic opportunities as an alternative to commercialization.
		Partnership with companies and NGOs .	Collaborate with local businesses and non-governmental organizations to promote employment initiatives. Promote investment in affected areas to generate sustainable employment.
5.	Strengthening rehabilitation and social support.	Improving rehabilitation centres.	Evaluate and improve existing rehabilitation centers. Ensure that programs are effective and address community needs.
		Psychosocial support.	Implement psychosocial support services for affected individuals and families. Address the underlying issues that contribute to marketing.
	Continuous evaluation and adjustment of strategies.	Monitoring key indicators.	Establish success indicators and continuously monitor their evolution. Adjust strategies according to the results obtained and changes in trends.

No.	Strategies	Action points	Scope
		Periodic evaluation meetings.	Organize regular meetings between local authorities, experts and community representatives. Evaluate progress and make strategic adjustments as necessary.
6.	Continuous evaluation and adjustment of strategies	Monitoring key indicators.	Establish success indicators and continuously monitor their evolution. Adjust strategies according to the results obtained and changes in trends.
		Periodic evaluation meetings.	Organize regular meetings between local authorities, experts and community representatives. Evaluate progress and make strategic adjustments as necessary.
7.	Collaboration with the community.	Creation of community committees.	Establish community committees to involve residents in decision-making. Promote active participation and collaboration with the authorities.
		Rewards and protection for whistleblowers.	Implement programs that protect those who report illegal activities. Offer incentives to encourage citizen cooperation

University Project: Implementation of Awareness Campaigns in Vulnerable Communities

Scope: Develop and implement awareness campaigns using cognitive analysis to improve perception and understanding of the risks associated with the commercialization of substances in vulnerable communities.

Duration: 12 months

General Objective: To reduce the marketing of substances in vulnerable communities through awareness campaigns based on cognitive analysis.

Specific objectives :

- Design specific awareness campaigns based on cognitive analysis.
- Evaluate the impact of campaigns on community perception and behavior.
- Provide educational resources to improve understanding of risks.

Stages:

- I. Campaign planning and design.
- II. Execution and dissemination of campaigns.
- III. Impact assessment through surveys and cognitive analysis.
- IV. Creation of additional educational resources.

Resources:

- Staff specialized in communication and psychology.
- Media (posters, brochures, social media).
- Surveying equipment.

Expected impact:

- Improved risk perception.
- Reduce marketing to specific communities.

Funding: Seek local sponsorship and support from government entities interested in prevention.

Results:

- Campaign impact and effectiveness report.
- Educational resources for continuous distribution.

Benefits to achieve:

- Increased community awareness.
- Active collaboration in prevention.

Role and participation of study centres:

- Design and execution of campaigns.
- Impact assessment through cognitive analysis.

The results obtained from the comprehensive study on the sale of controlled substances in Guayaquil reveal cognitive patterns that contribute to the increase in this phenomenon in the city. Through the application of surveys and interviews, key factors were identified, including the influence of organized crime, persistent poverty in vulnerable sectors, and social disintegration. Cognitive maps, as a central tool of the methodological approach, allowed a clear and detailed visualization of the interconnection of these elements.

Regarding the classification of substances, the results indicate a significant prevalence of the sale of highly addictive substances, particularly those known as "H": cocaine, crack cocaine and marijuana. The sale of these substances is not limited to individual transactions, but shows a direct relationship with organized crime, exacerbating problems of public safety in specific areas of the city. Additionally, it was identified that the consumption of these substances has a direct impact on the mental and physical health of individuals, contributing to the complexity of the problem.

The magnitude of the problem is evident when considering the variety of crimes arising from the trafficking of controlled substances, including robbery, rape, burglary, organized crime, criminal association, corruption and other violent crimes. These results underscore the urgent need to address not only the trafficking itself, but also related crimes that have a significant impact on the safety and quality of life of citizens.

5. Discussion

The findings of this study raise questions about the effectiveness of the measures currently implemented by local authorities in Guayaquil to combat the commercialization of controlled substances. The consensus among those interviewed on the need to review and strengthen government policies in this area underlines the importance of a more solid and focused intervention. The results indicate that, despite existing efforts, the magnitude of the problem persists, highlighting the need for more in-depth and specific strategies.

It is essential to highlight the interrelationship between drug trafficking and organised crime. Criminal groups have found in this illicit activity a means to maximise their income and perpetuate other criminal activities [17]. Territoriality in drug trafficking and disputes between gangs underline the need to address not only the sale of drugs but also the root of the problem, which includes the lack of economic opportunities and social disintegration in the affected areas.

The analysis of rights violations, particularly in the areas of health, access to justice and citizen security, highlights the complexity of the problem and the need for a comprehensive approach that goes beyond punitive measures. Suggestions from interviewees, such as reviewing the sanctions established in the COIP and addressing underlying causes, such as poverty and unemployment, point to specific areas for future interventions.

6. Conclusion

The research has highlighted the urgent need for comprehensive strategies to address the sale of controlled substances in Guayaquil. The comprehensive approach, supported by the integration of information through cognitive maps, reveals that the problem is multidimensional and that any mitigation effort must address not only the sale of substances but also its roots in organized crime, poverty and social disintegration.

The results demonstrate the need to review and strengthen existing government policies. The consensus among interviewees on the limited effectiveness of current measures underlines the urgency of a thorough review. The implementation of more effective and targeted policies, supported by cognitive analysis, can provide a more solid basis for combating the growing drug trade in the city.

Active community participation and the involvement of academic institutions are essential elements in the fight against this phenomenon. The proposed strategies and project should encourage collaboration between local authorities, universities and civil society. Awareness raising, education and citizen participation are essential to overcome current challenges and ensure that solutions are sustainable in the long term.

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