Neutrosophic Sets and Systems {Special Issue: Neutrosophy and Plithogeny: Fundamentals and Applications}, Vol. 69, 2024

University of New Mexico

Complex Analysis of Family and Social Problems in the Context of Parenting Competencies: Implementation of Neutrosophic Cognitive Maps (NCM) for the Evaluation and Resolution of Conflicts

Yoya B. Flores-Pérez[1], José M. Vázquez Antonio[2], Rigoberto Navarrete Flores[3], and Luz H. Cruzado Saucedo[4]

[1] National University of Trujillo. Peru. E-mail: yflores@unitru.edu.pe
[2] CIFE University Center Cuernavaca. Mexico. E-mail: professorjosemanuel@gmail.com
[3] National University of Trujillo. Peru. E-mail: rnavarrete@unitru.edu.pe
[4] National University of Trujillo, Peru. E-mail: lcruzados@unitru.edu.pe

Abstract. At the intersection of family and social problems, complex challenges arise that demand an innovative and profound approach - This article explores how parental competencies, essential for family dynamics, can be better understood and strengthened through the implementation of Neutrosophic Cognitive Maps (NCM). Using a multidimensional approach, real cases are analyzed where family conflicts and tensions are intertwined with broader social problems, revealing the need for advanced analytical tools that allow a detailed and accurate evaluation. NCM emerges as a robust methodology, capable of capturing the ambiguity and uncertainty inherent in human interactions, offering a new perspective for intervention and conflict resolution in complex family contexts. The application of Neutrosophic Cognitive Maps not only facilitates a more nuanced understanding of parenting competencies, but which also provides a framework for developing effective conflict resolution strategies. By integrating emotional, cognitive and social factors, NCMs allow for a holistic representation of family dynamics, capturing subtleties and variations that escape traditional approaches. This study, Through a rigorous and detailed analysis, it demonstrates how the adoption of this innovative tool can transform the way family problems are addressed, offering more adaptive and resilient solutions. Ultimately, the results underline the importance of incorporating advanced cognitive technologies in the field of psychology and family sociology to effectively confront contemporary challenges.

Keywords: Neutrosophic Logic, Neutrosophic Cognitive Maps, NCM, Parental Competencies.

1 Introduction

The complexity of family and social problems has been a constant concern for researchers and professionals in the social and behavioral sciences. At the heart of these interactions, parental competencies play a crucial role, largely determining the dynamics and well-being in families [1]. Parenting competencies, understood as the set of skills and abilities that parents use to raise and educate their children, are intrinsically linked to the social contexts in which they develop. However, the evaluation and resolution of The conflicts that emerge in these environments are usually arduous tasks, due to the multiplicity of intervening factors and the dynamic nature of human relationships [2]. In this context, Neutrosophic Cognitive Maps (NCM) are presented as an innovative methodological tool and promising. NCMs allow us to capture and analyze the uncertainty, ambiguity and paradoxes that characterize family and social interactions. Unlike traditional approaches, NCMs integrate multiple perspectives and degrees of truth, offering a more faithful and complete representation of the complex and multifaceted reality of parenting skills [3].

The implementation of NCM in the analysis of family and social problems opens new possibilities for intervention and conflict resolution - By incorporating neutrosophic elements, greater flexibility and adaptability is achieved in the modeling of human interactions, allowing the identification of patterns and dynamics that otherwise they would go unnoticed. This ability to capture subtleties and variations in parenting competencies is crucial for developing more effective and personalized intervention strategies . The need for advanced analytical tools becomes even more evident when we consider the increasing complexity of contemporary family and social contexts . Family structures have evolved, and with them, the challenges and conflicts they face. Family problems can no

longer be addressed with simplistic or one-dimensional solutions; require integrative approaches that consider the entire family system and its social environment [4].

In this sense, NCMs provide a theoretical and practical framework to address these complexities in a holistic manner. [5].The ability of NCMs to handle neutrosophic information – that which contains degrees of truth, falsity and indeterminacy – is particularly useful in the context of competencies. parental, where situations are often marked by uncertainty and ambivalence. This methodology not only facilitates a deeper understanding of family dynamics, but also allows the identification of more precise and effective interventions. The present research focuses on the application of Neutrosophic Cognitive Maps in the analysis of parental competencies and the resolution of family and social conflicts. Through case studies and detailed analysis, the advantages and limitations of this methodology are explored, as well as its potential to transform professional practice in the field of family psychology and sociology[6]. Real situations are examined where family conflicts and tensions are intertwined with broader social problems, demonstrating the usefulness of NCM to address these problems in a comprehensive and adaptive manner. Ultimately, this study seeks to contribute to the development of more effective and resilient intervention strategies, based on a deep and nuanced understanding of parental competencies and their interaction with the social context. By integrating NCM into the analysis of family and social problems, the aim is not only to improve the evaluation and resolution of conflicts, but also to encourage a more adaptive and sensitive approach to the complex and changing reality of contemporary families.

The methodological innovation represented by the implementation of Neutrosophic Cognitive Maps offers a renewed and powerful perspective to face current challenges in the field of social and behavioral sciences - This research not only expands the theoretical and practical horizon of parenting competencies, but which also opens new avenues for intervention and support for families in diverse and complex social contexts.

2. Related Works.

2.1 Parental Competencies: Analysis and Assessment.

Parenting skills represent a fundamental axis in the comprehensive development of children and adolescents, influencing not only their emotional well-being, but also their academic and social performance - These skills, understood as the set of skills, knowledge and attitudes that parents must be deployed to ensure positive parenting, they are essential for the establishment of a healthy and safe family environment – However, their evaluation and development present significant challenges, as they are deeply rooted in the cultural, social and economic context of each family [6]. The concept of parenting competencies covers a wide range of aspects, from the ability to provide affection and emotional support, to the ability to establish clear limits and rules. It is not enough to have good intentions; Parents must be able to translate these intentions into concrete actions that promote the optimal development of their children. Here lies one of the main complexities: the ability of parents to adapt and respond appropriately to the changing needs of their children over the course of their lives.

In practice, assessing parenting competencies can be a complicated process. Traditional assessment tools, such as questionnaires and interviews, often do not capture the entirety of family dynamics. Additionally, subjective and emotional factors that influence perception of parenting competencies can bias the results. For this reason, it is crucial to develop more sophisticated assessment methods that integrate different dimensions and perspectives [7]

One of the most innovative proposals in this field is the use of Neutrosophic Cognitive Maps (NCM). NCMs allow a richer and more nuanced representation of parenting competencies, capturing the uncertainty and ambiguity that characterize many family interactions. Through From this methodology, a more complete and precise vision of parents' strengths and areas of improvement can be obtained, facilitating the identification of more effective intervention strategies - It is important to highlight that the development of parenting skills is not a linear or uniform process. Parents face a variety of challenges and obstacles that can affect their ability to optimally exercise their competencies. Factors such as stress, lack of financial resources, and interpersonal tensions can have a significant impact. Therefore, interventions aimed at improving parenting skills must be holistic and adaptive, considering the unique context of each family [8].

In terms of public policy, it is essential that parenting support programs not only focus on training and education of parents, but also provide comprehensive support that addresses external factors that may influence their performance. This includes access to mental health services, economic support, and community support networks. Only through a multidimensional approach can sustainable improvements in parenting skills be achieved. The impact of parenting skills transcends the family sphere, also affecting the community and society as a whole. Children who grow up in positive and supportive family environments tend to be more resilient, have better academic results, and develop stronger social skills. Therefore, investing in the development of parenting skills is not only a matter of social justice, but also an effective strategy to promote well-being and long-term social progress. Parenting competencies are a crucial component for the healthy and balanced development of children and adolescents. The evaluation and improvement of these competencies requires innovative and adaptive approaches that consider the

complexity and diversity of family dynamics. Neutrosophic Cognitive Maps represent a promising tool in this regard, offering a way to capture and analyze family interactions more deeply and accurately. At the same time, it is It is essential that parenting support policies and programs are comprehensive and holistic, providing parents with the resources and support necessary to play their role effectively and sustainably[9].

2.2. Neutrosophic Cognitive Maps.

In the vast field of social and behavioral sciences, the need for analytical tools that capture the complexity and uncertainty of human interactions is increasingly evident – Neutrosophic Cognitive Maps (NCM), an innovative methodology that integrates the principles of neutrosophic logic, have emerged as a promising solution to address this need. NCMs allow modeling situations that include degrees of truth, falsity and indeterminacy, offering a more faithful and nuanced representation of reality [9]. The concept of NCM is based in neutrosophic set theory, developed by Florentin Smarandache, which extends classical logic to handle uncertainty, ambiguity and paradox. This theory introduces a third neutral value (I), in addition to the traditional values of truth (T) and falsity (F), allowing a more flexible and adaptive representation of information. NCMs apply these principles to the field of cognitive maps, allowing a graphical and analytical representation of the causal relationships and dynamics of complex systems [10].

In the context of parenting competencies and family and social issues, NCMs offer a powerful tool for assessment and intervention – Family interactions are often marked by ambivalence and contradiction, and traditional approaches may be insufficient to capture this complexity. NCMs, by incorporating neutrosophic elements, allow a richer and more detailed representation of these dynamics, facilitating a deeper and more precise understanding.

The implementation of NCM in the analysis of parenting competencies involves the identification and modeling of causal relationships between different factors and behaviors [11]. For example, an NCM can represent how effective communication between parents and children influences the emotional development of the child, or how economic stress can affect parents' ability to set clear boundaries. By capturing these nuances, NCMs provide a solid foundation for the development of more effective and personalized intervention strategies. One of the main advantages of NCMs is their ability to manage indeterminacy and uncertainty, aspects that are inherent to human interactions. In familiar situations, there are often unknown factors or variables that cannot be clearly defined . NCMs allow these elements to be incorporated explicitly into the model, offering a more complete and realistic representation of the situation [12]. This is particularly useful in the assessment of parenting competencies, where perception and subjectivity play a crucial role.

Furthermore, NCMs facilitate the identification of patterns and dynamics that may not be evident through traditional analysis methods - By graphically representing causal relationships and interactions between different factors[13, 14] . NCMs allow the underlying structure of the system to be visualized and detect areas of conflict or dysfunction. This capacity for in-depth analysis is essential for the design of more precise and effective interventions. The use of NCM in the evaluation of parenting skills and the resolution of family and social problems not only offers benefits at the individual level, but also to community and societal level. By providing a more accurate and detailed understanding of family dynamics, NCMs can inform the development of more effective and adaptive policies and support programs. This, in turn, can contribute to improving the overall well-being of families families and strengthen the social fabric.

Neutrosophic Cognitive Maps represent an innovative and powerful tool for evaluation and intervention in the field of parenting skills and family and social problems - By allowing a richer and more nuanced representation of reality, capturing indeterminacy and uncertainty, NCM offer a renewed and profound perspective to address the complex challenges of human interactions – The adoption and development of this methodology promises to significantly transform professional practice in the social and behavioral sciences, providing new avenues for understanding and supporting families in diverse and changing contexts [14].

In this study, neutrosophic cognitive maps will be used, so we explain them below.

Definition 1[14] : Let X be a universe of discourse - A Neutrosophic Set (NS) is characterized by three membership functions, $u_A(x)$, $r_A(x)$, $v_A(x)$: which satisfy the condition -$0 \leq \inf u_A(x) + \inf r_A(x) + \inf v_A(x) \leq \sup u_A(x) + \sup r_A(x) + \sup v_A(x) \leq 3+$.

Definition 2 [15, 16]: Let X be a universe of discourse - A single-valued neutrosophic set (SVNS) A in X is a set of the form :

$$A = \{ \langle x, u_A(x), r_A(x), v_A(x) \rangle : x \in X\} \quad (1)$$

Where u_A , r_A , $v_A : \in A(x)$ are the true, indeterminate, and falsity membership functions of x in A, respectively . For convenience, a single-valued neutrosophic number (SVNN) will be expressed as A = (a, b, c), where a, b, c $\in [0,1]$ and satisfies $0 \leq a + b + c \leq 3$.

Other important definitions are related to graphs [17-20]

Definition 3 : A *neutrosophic graph* contains at least one indeterminate edge , represented by dotted lines
Definition 4 : A *neutrosophic directed graph* is a directed graph that contains at least one indeterminate edge, which is represented by dotted lines .
Definition 5: A *neutrosophic cognitive map (NCM) is a* neutrosophic directed graph , whose nodes represent concepts and whose edges represent causal relationships between the edges .
If there are k vertices C_1 , C_2 ,…, C_k , each can be represented by a vector (x_1 , x_2 ,…, x_k) where xi ∈ {0,1, I} depending on the state of the vertex C_i at a specific time or situation:

- x_i = 0: Vertex C_i is in an activated state.
- x_i = 1: Vertex C_i is in deactivated state.
- x_i = I: The state of vertex C_i is indeterminate.

Definition 6 : An NCM that has edges with weights in {−1, 0, 1, I} is called *a simple neutrosophic cognitive map* [20].
Connections between vertices: a directed edge from C_m to C_n is called a connection and represents causality from C_m to C_n.
Associate weights to each vertex: Each vertex in the NCM is associated with a weight within the set { 0 , 1, -1, I} . The weight of the edge $C_m C_n$, denoted as α_{mn} , indicates the influence of C_m on C_n and can be:
-α_{mn} = 0: Cm has no effect on C_n.
-α_{mn} = 1: An increase (decrease) of C_m results in an increase (decrease) of C_n.
-α_{mn} = -1: An increase (decrease) of C_m results in a decrease (increase) of C_n.
-α_{mn} = I: The effect of C_m on C_n is indeterminate.
Definition 7: If C_1 , C_2 ,…, C_k are the vertices of an NCM. The neutrosophic matrix N(E) is defined as N(E) = α_{mn}), where α_{mn} denotes the weight of the directed edge $C_m C_n$, with α_{mn} ∈ [-1,0,1, I]. N (E) is called *the neutrosophic adjacency matrix* of the NCM.
Definition 8: Let C_1 , C_2 ,…, C_k be the vertices of an NCM. Let A = (a_1 , a_2 ,…, a_k), where am ∈ {-1, 0, 1, I} . A is called *the neutrosophic instantaneous state vector* and means an on-off-indeterminate state position of the vertex at a given instant.
- a_m = 0 if C_m is disabled (has no effect),
- a_m = 1 if C_m is activated (takes effect),
- a_m = I if C_m is indeterminate (its effect cannot be determined).

Definition 9: Let C_1 , C_2 ,…, C_k be the vertices of an NCM. Let $\overrightarrow{C_1C_2}$, $\overrightarrow{C_2C_3}$, $\overrightarrow{C_3C_4}$, … , $\overrightarrow{C_mC_n}$ the edges of the NCM be, then the edges constitute a *directed cycle*.
- The NCM is said to be *cyclic* if it has a directed cycle - It is said to be *acyclic* if it does not have any directed cycle.
Definition 10: An NCM containing cycles is said to have *feedback*. When there is feedback in the NCM it is said to be a *dynamic system*.
Definition 11: Let $\overrightarrow{C_1C_2}$, $\overrightarrow{C_2C_3}$, $\overrightarrow{C_3C_4}$, … , $\overrightarrow{C_{k-1}C_k}$ be a cycle. when C_m is activated and its causality flows along the edges of the cycle and then is the cause of C_m itself, then the dynamical system is circulating. This is valid for each vertex C_m with m = 1, 2,… , k. The equilibrium state of this dynamic system is called the *hidden pattern*.
Definition 12: If the equilibrium state of a dynamical system is a single state, then it is called a *fixed point*. An example of a fixed point is when a dynamical system starts being activated by C_1. If the NCM is assumed to be set at C_1 and C_k , which means the state remains as (1, 0,…, 0, 1), then this neutrosophic state vector is called fixed point.
Definition 13: If the NCM establishes a repeating neutrosophic state vector of the form:
$A_1 \rightarrow A_2 \rightarrow \cdots \rightarrow A_m \rightarrow A_1$LCM *limit cycle*.

3. Results and discussion

After the identification of eight family and social problems that show deficiencies and have an impact on parenting skills, as specified in Table 1, progress was made towards the development of an NCM. The objective was to illustrate the causal connections between these elements through a map neutrosophic cognitive, whose process involved defining the interactions between the various factors. The visual representation of this analysis is detailed in Figure 1.

Table 1: Family and social problems that show deficiencies and have an impact on parenting skills

D 1. Domestic violence: Physical, emotional, or verbal violence within the home can deeply affect both parents and children, altering family dynamics and negatively affecting parenting skills.

D 2. Child abuse: Physical, emotional or sexual abuse of children can generate deep trauma and emotional difficulties in child development, affecting parents' ability to provide a safe and supportive environment.
D 3. Mental health problems: Conditions such as depression, anxiety, bipolar disorder or other mental illnesses can interfere with parenting skills, hindering parents' ability to adequately care for their children.
D 4. Divorce and separation: The breakup of the couple and the transition to single-parent families can introduce additional stresses and challenges in raising children, affecting emotional stability and family cohesion.
D 5. Addictions: Parental abuse of substances such as alcohol and drugs can cause significant dysfunction in the family, affecting the ability to maintain a safe and predictable environment for children.
D 6. Unemployment and economic difficulties: Lack of financial resources can increase family stress and limit access to educational and social services and opportunities, affecting the family's overall well-being and the ability to adequately raise children.
D 7. Lack of support networks: The absence of family, community or social support networks can leave parents without emotional or practical resources to face the daily challenges of parenting, affecting the quality of care they can offer.
D 8. Educational problems: Academic difficulties or lack of access to quality education can limit children's future opportunities, creating additional tensions in the home and affecting the self-esteem of both parents and children.

These problems may vary in their impact depending on the cultural, social and economic context of each family, but all have the potential to negatively influence parental skills and the healthy development of children .

The process began by developing an NCM to represent the causal connections between the eight identified family and social problems, which affect parenting competencies according to Table 2 . This stage involved defining the interactions between various factors and visualizing them in a detailed neutrosophic cognitive map in Figure 1.

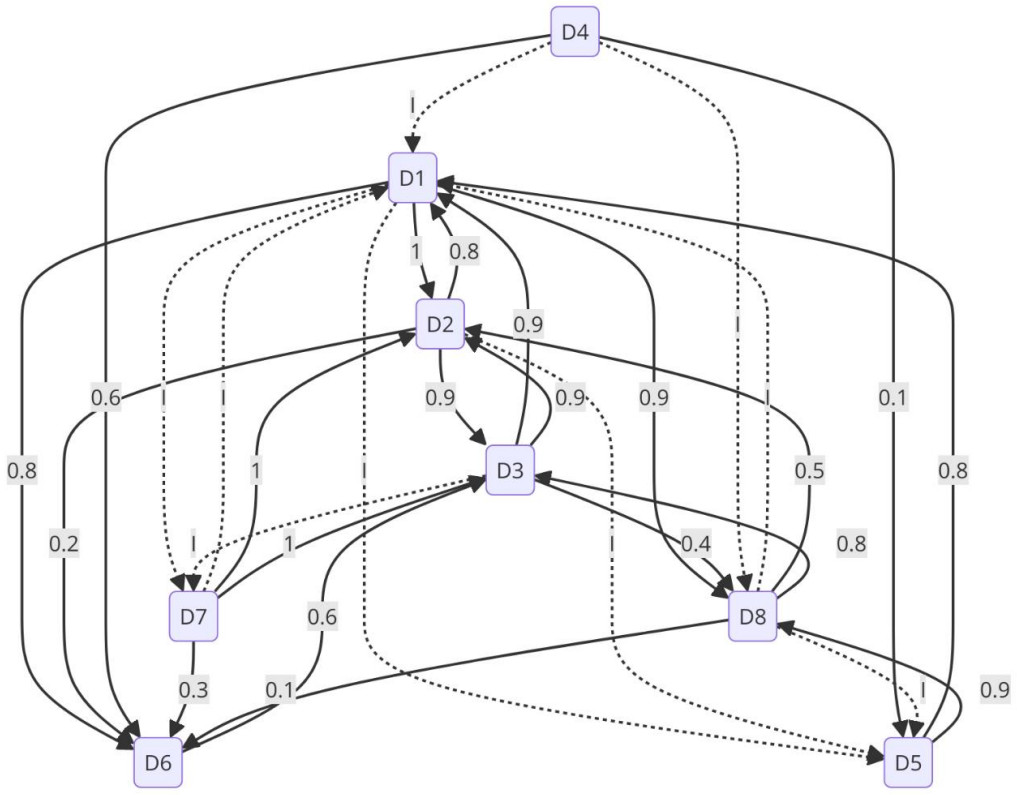

Figure 1: Neutrosophic cognitive maps

The NCM is developed through the collection and representation of relevant knowledge – The adjacency matrix obtained, which is based on the neutrosophic values provided by specialists, is detailed in Table 2 as an essential tool to analyze and interpret causal connections within the framework of the study.

Table 2: Adjacency matrix

	D1	D2	D3	D4	D5	D6	D7	D8
D1	0	1	0	0	I	0.8	I	0.9
D2	0.8	0	0.9	0	I	0.2	0	0
D3	0.9	0.9	0	0	0	0	I	0.4
D4	I	0	0	0.1	0.6	0	0	I
D5	0.8	0	0	0	0	0	0.9	0
D6	0	0	0.6	0	0	0	0	0
D7	I	1	1	0	0	0.3	0	0
D8	I	0.5	0.8	0	I	0.1	0	0

Following this perspective, the calculated centrality measures are presented below (Table 3). These metrics provide a quantitative analysis of the relative relevance of nodes within the network framework, which is crucial for understanding the dynamics and impact of the various components in the analyzed system.

Table 3: Centrality analysis

Node	*od(vi)*	*id(vi)*	*td(vi)*
D1	1.8+2I	0.8+3I	2.6+5I
D2	1+I	2.5	3.5+I
D3	0.4+I	1.6	2+I
D4	0.6+2I	0	0.6+2I
D5	0	0.6+3I	0.6+3I
D6	0.6	1.3	1.9
D7	2,3+I	0+2I	2,3+I
D8	0.5+2I	0.4+I	0.9+2I

In the context of static analysis in the NCM, initial results are obtained that incorporate the element of indeterminacy "I" within their neutrosophic values. To refine these results it is essential to carry out a process known as deneutrosophication, recommended by[21] . This process consists of replacing the indeterminacy parameter I, which ranges between 0 and 1, considering in this case "I" as 0.5. The importance of this method lies in its ability to produce more defined and precise results, which significantly simplifies the understanding of the interconnections present in the analysis in question (Table 4).

Table 4: Deneutrosophicated values of centrality

Nod	*td(vi)*
D1	5.1
D2	4
D3	2.5
D4	2.6
D5	3.6
D6	1.9
D7	2.8
D8	1.9

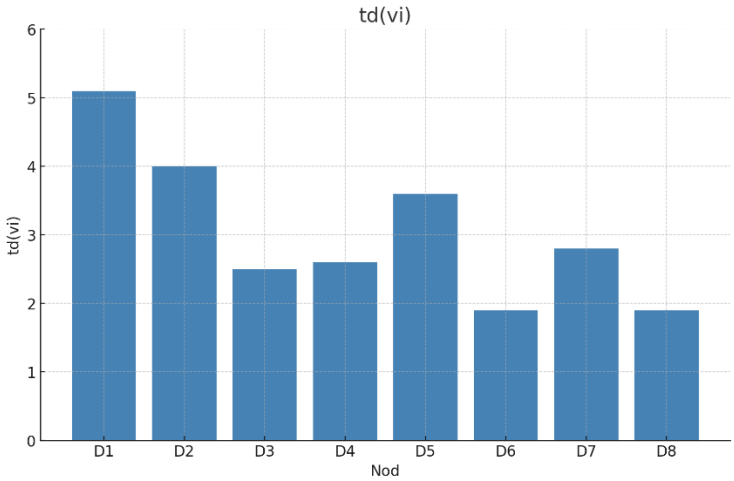

Figure 2: Deneutrosophicated centrality.

These values reflect the strength of the outgoing and incoming relationships, as well as the total centrality of each node within the cognitive map, after considering indeterminacy as a neutrosophic influence to a medium degree.

The family and social problems identified—such as domestic violence, child abuse, mental health problems, divorce and separation, addictions, unemployment and economic difficulties, lack of support networks, and educational problems—stand out as critical factors that profoundly affect parenting competencies and family well-being. These aspects not only compromise emotional stability within the home, but also have significant repercussions on parents' ability to raise their children in an effective and healthy manner. Violence Domestic violence, for example, not only physically affects those involved, but also creates an emotionally unstable environment that can harm family relationships and undermine essential parenting skills – Similarly, child abuse introduces deep trauma that negatively impacts development. emotional and psychological problems of children, affecting the ability of parents to provide a safe and protective environment. Mental health problems, such as depression and anxiety, add an additional layer of complexity to the family landscape, hindering the ability of parents to maintain a stable and consistent emotional presence that benefits the healthy growth of their children. In addition, divorce and the transition to single-parent families impose additional challenges, including managing new family dynamics and adapting to emotional changes that can influence competencies parental.

Addictions, whether to alcohol, drugs or other substances, also have a disruptive effect on the family structure, altering the ability of parents to provide a predictable and safe environment – Likewise, unemployment and economic difficulties not only generate stress financial, but also limit access to essential resources and educational opportunities, directly affecting the overall well-being of the family and the quality of care they can provide. The lack of support networks, both family and community, leaves parents without the emotional and practical support necessary to face the daily challenges of parenting. This lack can result in emotional and social isolation that

negatively impacts parents' ability to provide an appropriate and nurturing parenting environment. Lastly, educational problems, such as lack of access to quality education, can profoundly affect children's future prospects, creating additional tensions in the home and affecting the self-esteem of both parents and children. The detailed analysis of these problems along with the results of neutrosophic calculations reveals the complexity and interconnection of the factors that affect parenting competencies. The assessment of deneutrosophic centrality indicates which aspects have the most significant impact in this context, providing a solid basis for developing interventions and policies that effectively address effectively address family and social challenges. It is essential to adopt a holistic and comprehensive approach that recognizes the interdependence of these problems to promote healthier family environments and support the comprehensive development of children.

4. Conclusion

The family and social problems identified, such as domestic violence, child abuse, mental health problems, divorce and separation, addictions, unemployment and economic difficulties, lack of support networks, and educational problems, have been analyzed in depth, revealing their significant impact on parenting competencies and family well-being. These factors not only affect emotional stability within the home but also compromise the ability of parents to raise their children effectively and healthily. Domestic violence emerges as a critical factor that generates an emotionally unstable environment, affecting family relationships and weakening essential parenting skills. Similarly, child abuse introduces deep traumas that negatively affect the emotional and psychological development of children, hindering the ability of parental care to ensure a safe and protective environment. Challenges associated with mental health, such as depression and anxiety, further complicate the family landscape by hindering the emotional stability necessary for the healthy development of children. Additionally, the divorce process and the transition to single-parent family structures present new challenges, including managing changing family dynamics and adapting to the emotional needs of children.

Addictions, along with unemployment and economic hardship, not only create financial stress but also limit access to essential resources and educational opportunities, directly affecting the overall well-being of the family and the quality of the parenting environment offered to children. The lack of support networks, both family and community, leaves parents without the emotional and practical support necessary to face the daily challenges of parenting, which can lead to isolation that negatively affects the quality of parental care. Finally, educational problems, such as limited access to quality education, deeply impact children's future prospects, creating additional tensions in the home and affecting the self-esteem of both parents and children. The analysis of these problems, combined with the results of neutrosophic calculations to assess deneutrosophic centrality, reveals the complexity and interconnection of these factors in parenting competencies. This analysis provides a solid foundation for the development of effective interventions and policies that address these challenges holistically. It is essential to adopt a comprehensive approach that recognizes the interdependence of these problems to promote healthier family environments and support the comprehensive development of children. This involves implementing strategies that strengthen social support networks, improve access to mental health and educational services, and encourage positive and resilient parenting practices. Only through this integrated approach can we move towards more equitable societies and stronger, more cohesive families.

In future work, it would be valuable to explore the application of neutrosophic cognitive maps combined with multicriteria methods to analyze and address these complex problems. This combination could provide a deeper and more structured understanding of the interrelationships between the various factors affecting parenting competencies and family well-being, allowing for the design of more precise and effective interventions.

5. References

[1] Jensen, T. M., & Sanner, C. (2021). A scoping review of research on well-being across diverse family structures: Rethinking approaches for understanding contemporary families. Journal of Family Theory & Review, 13(4), 463-495.

[2] Cabrıta, M. M., Torres, L. T., & El-Kanj, N. (2024). Neutrosophic Cognitive Maps for Mediation as a Conflict Resolution Method in Traffic Conflicts. Full Length Article, 24(1), 249-49.

[3] Kandasamy, I., Arumugam, D., Rathore, A., Arun, A., Jain, M., .W.B, V., & Smarandache, F. (2023). NCMPy: A Modelling Software for Neutrosophic Cognitive Maps based on Python Package. Neutrosophic Systems With Applications, 13, 1-22. https://doi.org/10.61356/j.nswa.2024.114.

[4] Guevara, J. A. U., Andrade, E. E. P., Arnaiz, N. V. Q., & Fernández, D. M. M. (2023). Neutrosophic analysis of group dynamics and teamwork. Neutrosophic Sets and Systems, 62, 217-226.

[5] Navarrete Abedrabbo, X. C., Morales Cobos, J. D., Ortiz Araque, S. M., & Paredes Mena, N. P. (2023). Método para la evaluación de efectos de los accidentes con hipoclorito de sodio en niños en odontopediatría mediante Mapa Cognitivo Difuso. Neutrosophic Computing & Machine Learning, 30.

[6] Abdelhafeez , A., Aziz, A. and Khalil , N. (2022) “Building a Sustainable Social Feedback Loop: A Machine Intelligence Approach for Twitter Opinion Mining”, Sustainable Machine Intelligence Journal, 1, pp. (6):1–12. doi:10.61185/SMIJ.2022.2315.

[6] L. Z. Lara Moran and I. Álvaro Gaibor González, "Family functionality and its relationship with subjective well-being in high school students: Family Functionality and Its Relationship with Subjective Well-Being in High School Students," LATAM Revista Latinoamericana De Ciencias Sociales And Humanities, vol. 4, no. 1, pp. 987–996, 2023. [Online]. Available: https://doi org/10 56712/latam v4i1 311

[7] F. López Piza, "The teaching of socio-emotional education in primary school from the perspective of socio-formation," Forhum International Journal of Social Sciences and Humanities, vol. 3, no. 4, pp. 149–161, 2021. [Online]. Available: https://doi org/10 35766/j forhum2021 04 03 12

[8] V. M. Márquez Allauca, R. M. Reyes Vargas, M. L. Merchán Gavilánez, and D. D. R. Valle Gavilanes, "Parental competencies in the socio-affective development in girls and boys from 3 to 5 years old," RECI-AMUC , vol. 5, no. 3, pp. 182-195, 2021. [Online]. Available: https://doi org/10 26820/reciamuc/5 (3) agosto 2021 182-195

[9] J. Maya and M. V. Hidalgo, "Evaluation of the implementation of the Family Training and Support Program with Peruvian families," Apuntes De Psicología, vol. 34, no. 2-3, pp. 113–118, 2022. [Online]. Available: https://doi org/10 55414/ap v34i2-3 603

[10] Dimitri, V. B., De Jesús, M. G., & Enrique, P. A. (2022). Neutrosophic cognitive maps for analysis of social problems analysis. International Journal of Neutrosophic Science (IJNS), 19(1).

[11] Smarandache, F. (2024). Fundamentos de Topologías de Vanguardia (artículo de revisión parcial). Revista Asociación Latinoamericana de Ciencias Neutrosóficas. ISSN 2574-1101, 31, 01-22.

[12] Leyva-Vázquez, M., Pérez-Teruel, K., Febles-Estrada, A., & Gulín-González, J. (2013). Causal knowledge representation techniques: A case study in medical informatics. Revista Cubana de Información en Ciencias de la Salud (ACIMED), 24(1), 73-83.

[13] Torres, L. C., Gaibor, J. N., & Vazquez, M. L. (2022). Modelo de optimización para inventarios, basado en Simulación Monte Carlo y Algoritmo Metaheurístico Genético. Universidad y Sociedad, 14(S6), 448-458.

[14] Parrales-Bravo, F., Caicedo-Quiroz, R., Rodríguez-Larraburu, E., & Barzola-Monteses, J. (2024, May). ACME: A Classification Model for Explaining the Risk of Preeclampsia Based on Bayesian Network Classifiers and a Non-Redundant Feature Selection Approach. In Informatics (Vol. 11, No. 2, p. 31). MDPI.

[15] Abouhawwash, M. and Jameel, M. (2023) “Evaluation Factors of Solar Power Plants to Reduce Cost Under Neutrosophic Multi-Criteria Decision Making Model”, Sustainable Machine Intelligence Journal, 2, pp. (1):1–11. doi:10.61185/SMIJ.2023.22101.

[16] Smarandache, F., Zhang, Y., & Sunderraman, R. (2009). Single valued neutrosophic sets. Neutrosophy: neutrosophic probability, set and logic, 4, 126-129.

[17] El- Douh , A. (2023) “ A Neutrosophic Multi-Criteria Model for Evaluating Sustainable Soil Enhancement Methods and their Cost Implications in Construction ”, Sustainable Machine Intelligence Journal , 5, pp. (1):1–11. doi:10 61185/SMIJ 2023 55101

[18] Alava, R. P., Zambrano, R. B., & Vazquez, M. L. (2018). Pest analysis based on neutrosophic cognitive maps: a case study for food industry. Neutrosophic Sets and Systems, 21, 84-92.

[19] Wajid, M. S., Terashima-Marin, H., Paul Rad, P. N., & Wajid, M. A. (2022). Violence detection approach based on cloud data and Neutrosophic cognitive maps. Journal of Cloud Computing, 11(1), 85.

[20] Cepeda, M. D. L. L., Quilambaque, J. V. P., Quispe, A. M. N., Álvarez, E. T. M., & Pérez, J. F. R. (2021). Hermeneutical Analysis of the Determinants of Obesity using Neutrosophic Cognitive Maps. Neutrosophic Sets and Systems, 44, 90-99.

[21] Kandasamy, W. V., & Smarandache, F. (2004). Fuzzy Cognitive Maps and Neutrosophic Cognitive Maps. Book Review by Milan Mares: Kybernetika, 40(1), 151.

[22] Pérez-Teruel, K., & Leyva-Vázquez, M. (2012). Neutrosophic logic for mental model elicitation and analysis. Neutrosophic Sets and Systems, 30.

Received: February 24, 2024. **Accepted:** June 15, 2024