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Mapping cooperation: insights into Colombia's humanitarian response to migration from Venezuela

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Introduction: Since 2015, Colombia has faced a significant humanitarian challenge, receiving 2.9 million displaced Venezuelans. This study examines organizational cooperation in the humanitarian response to this migration crisis, aiming to understand the coordination dynamics among key organizations and actors.

Methods: Our research combined interviews and web scraping to gather data on key actors and their relationships in the humanitarian response. We employed Social Network Analysis (SNA) to examine these relationships and the collaborative strategies among entities, focusing on how they address the migration challenges.

Results: The results indicate that cooperation occurred through mediated channels, where established NGOs collaborated via coordination mechanisms established by international non-governmental organizations (INGOs), often involving diaspora volunteer-based organizations and through *ad-hoc* coordination. We also identified that organizations specializing in specific activities often exhibited limited coordination with others operating in the same sector. Lastly, the results suggest that coordination mechanisms played a crucial role in driving activities and facilitating the diversification of responses, partly through allocating financial resources.

Discussion: This study contributes to the humanitarian aid and migration literature, focusing on Colombia's migration response. It employs a mixed-methods approach, including Social Network Analysis (SNA), to explore the dynamics within humanitarian networks. It highlights the role of the Venezuelan diaspora NGOs, challenging the conventional view of migrants solely as aid recipients. The research uncovers the complex roles of intermediaries and coordination mechanisms, offering new insights into constructing effective humanitarian network structures. It advocates for a collaborative and inclusive approach to managing migration situations.

KEYWORDS

coordination, humanitarian aid, Venezuelan migration, social network analysis, Venezuelan diaspora-based organizations

1 Introduction

In the last decades, the migration history between Colombia and Venezuela started with Colombians fleeing violence in the 1970s, where they sought refuge and a new life in Venezuela ([Alto Comisionado de las Naciones Unidas para los Refugiados, 2008](#)). Colombia was often described as a migration-generating country ([IOM UN MIGRATION, 2013](#)). This flow changed direction in 2015 when hundreds of thousands of Venezuelan nationals, including Colombian citizens, escaping the economic crisis, fled to Colombia, and millions scattered throughout South America and the Caribbean.

Currently, the estimated number of Venezuelan migrants in Colombia is ~2.9 million nationals ([Observatorio de Venezuela de la Universidad del Rosario and Fundación Konrad Adenauer, 2023](#)). This population represents a cumulative result of several migration “waves.” The initial wave (2014–2017) saw the arrival of skilled Venezuelan migrants ([Muñoz-Mora et al., 2022](#)). This wave was succeeded by a more heterogeneous group (2017–2018), including many who traveled by foot ([Palma-Gutiérrez, 2021; Muñoz-Mora et al., 2022](#)). A subsequent wave, started around 2018, was predominantly characterized by migrants known as “walkers” ([Taraciuk Broner, 2018](#)). These successive waves challenged Colombia’s capacity to respond adequately, as no infrastructure was designed to support immigration.

Several evolving drivers have shaped these waves ([Alvarez et al., 2022; Bütotová, 2022](#)). Initially, the migration was primarily driven by economic decline and political instability in Venezuela. As conditions in Venezuela continued deteriorating, a humanitarian crisis appeared, and subsequent waves of migration comprised individuals and families escaping critical conditions marked by acute food and medicine shortages. The last wave included many women and children seeking family reunification and joining relatives initially settling in Colombia. In all waves, employment opportunities in Colombia (both formal and informal) attracted Venezuelan migrants, drawn by the relative stability and economic prospects compared to their homeland.

The Colombian government’s response to this influx began with strategies to manage and assist migrants ([Presidencia de Colombia, 2020](#)). Hundreds of policies and regulations between 2015 and 2020 ([Padilla et al., 2021](#)) catalyzed a broader policy to later introduce the Temporary Protection Status for Venezuelan Migrants under the Temporary Protection Regime ([Migración Colombia, 2023](#)). However, Colombia’s response to the migration crisis faced criticism for its slow pace and fragmented coordination ([Serbin Pont and Quest, 2018](#)). Although Colombia has been acknowledged for its leadership role in addressing the situation ([Rossiasco de Narvaéz, 2023](#)), the early strategies only achieved partial success.

For instance, Colombia’s Special Permit of Stay (PEP) initiative, launched in 2017 ([Ministerio de Relaciones Exteriores, 2017](#)) in response to the Venezuelan migration crisis, was a crucial development, granting legal status to many migrants. This legal status enabled access to vital services like healthcare, education, and formal employment, fostering social integration. Initially conceived as an ad hoc measure, the PEP offered a 2-year, extendable residency, providing Venezuelan migrant, who entered the country regularly, with immediate relief and stability. However, the temporary nature of this permit posed challenges, leaving migrants uncertain about their long-term future in Colombia and lacking a clear pathway to more permanent solutions like residency or citizenship.

Despite its initial success, the PEP faced several limitations. The challenges included difficulties in accessing banking services and varying degrees of acceptance across Colombian sectors, which impeded the full integration of Venezuelan migrants. In addition, the complexity of eligibility criteria and limited awareness about the PEP’s various iterations ([Del Real, 2022; Selee and Bolter, 2022](#)) resulted in inadequate coverage, leaving nearly 1 million undocumented Venezuelan migrants by 2021. The significant

influx of migrants also pressured local resources and infrastructure, revealing gaps in the PEP’s capacity to address these broader challenges. Administrative hurdles, including processing delays and accessibility issues, further undermined the effectiveness of the permit.

The Interagency Group on Mixed Migratory Flows (GIFMM), established toward the end of 2016 ([R4V, 2021](#)), has played a vital role in complementing the Colombian Government’s initiatives. Jointly led by the International Organization for Migration (IOM) and the United Nations High Commissioner for Refugees (UNHCR), this group serves as platform for collaboration and coordination among the interested organizations. It includes 81 members from UN agencies, international and local NGOs, and the Red Cross Movement members. GIFMM maintains a local presence in 14 of 32 states in Colombia, addressing the needs of Venezuelan refugees and migrants, Colombian returnees, and host communities.

However, it was the establishment of the Administrative Registry of Venezuelan Migrants (RAMV) (Also called PEP-III) in 2018 ([Migración Colombia, 2018](#)) that marked a significant turning point in the government’s response. The registry was the first national census initiative aimed at documenting and understanding the Venezuelan migrant population within its borders, by collecting data on demographic characteristics, location, and socioeconomic status of migrants. Although not all migrants access to the RAMV, it played a critical point as the national government identified that the migration situation was more significant than anticipated and involved cities beyond Colombia’s border. While many migrants were not registered ([Migración Colombia, 2018](#)), the Government could better understand and plan for establishing solutions. This realization improved measures in crucial health, education, and international cooperation.

The adaptation of the Venezuelan migration response, uncovered by the RAMV, extended beyond traditional border areas to include key non-border cities like Barranquilla on the Caribbean Coast. This city, among others, contrasting with the usual border localities, presented unique urban challenges that were previously overlooked. Recognizing this, international organizations such as the United Nations High Commissioner for Refugees (UNHCR) strategically expanded their operations to these areas. This critical enlargement of their scope was pivotal in providing all-encompassing support, ensuring that border and non-border regions across Colombia received assistance, thereby adapting to the multifaceted nature of the migration crisis.

As of today, the response has evolved; the emergence of local non-governmental organizations (NGOs) from the Venezuelan diaspora dedicated to assisting the migrant population, for instance, has played a role in this response. These local NGOs have responded rapidly to fill the support gap on the ground. Their fieldwork was crucial in delivering essential supplies, such as food, shelter, medical care, and legal assistance, to migrants at critical locations along the border.

As the response evolved, so did the complexity of collaboration toward maintaining and improving that response. International agencies, NGOs, government agencies, and diaspora actors, among others, have played a role in how Colombia has received and is currently integrating 2.9 million Venezuelans.

This study examines the dynamics of cooperation among diverse organizations involved in the humanitarian response to the migration situation from Venezuela into Colombia. The research integrates insights from interviews with key actors and data from organizational websites, employing a mixed-methods approach. In our analysis, we discuss the network's structure and the roles of various organizations. The focus is on how these entities interact, coordinate, and contribute to humanitarian efforts. This analysis aims to identify strategies to improve the network's efficiency and inclusiveness. Additionally, the study provides a quantitative understanding of collaborations through social network analysis.

Section 2 anchors the paper by providing background information on two key areas: coordination and its importance in humanitarian response, and the role of social networks in examining the structure of the relationships among actors. Section 3 explains the methods used for data collection and analysis. Data were collected via interviews and manual web scraping. Social Network Analysis (SNA) provides the means for establishing measures of connectedness while identifying key actors. Section 4 presents the results and discussion, followed by the limitations and recommendations for future work.

2 Literature review

2.1 The role of coordination

In humanitarian aid, *coordination* is defined as bringing together various actors to ensure a coherent response to emergencies (ICVA Humanitarian Learning, 2021). Coordination must ensure that humanitarian efforts are carried out jointly and efficiently, avoiding duplication of effort and guaranteeing that aid reaches those in need quickly and effectively. As United Nations Office for the Coordination of Humanitarian Affairs (OCHA) emphasizes, these aims are realized by promoting predictability, accountability, and collaboration among the involved actors (ICVA Humanitarian Learning, no date). This approach includes strategic planning, assessing current situations and needs, establishing shared priorities, developing joint strategies to address specific challenges, creating consistent public messages, and monitoring the progress of actions undertaken. To achieve these tasks, coordination takes place under the principles of cooperation. Cooperation is essential to avoid duplication of efforts and to achieve timely and effective aid to the migrant and refugee population. In other words, cooperation is expected when coordination occurs.

Coordination is a complex and expensive activity that requires mechanisms to simplify it. These *Mechanisms* are structures or strategies established by different areas or sectors to facilitate the flow of information or resources. This perspective is consistent with Minear (2002), who posits that the intricate nature of humanitarian coordination requires orchestrating relationships at various levels through such mechanisms to complement humanitarian response. Minear highlights the dynamics and constant evolution of coordination in response to unpredictable emergencies, underlining the importance of planning, policies, collaborative information gathering and sharing, resource mobilization, and strong leadership.

NGOs and international agencies provide resources and support in coordinating and flowing information, while local communities contribute with knowledge. In this framework, intermediaries emerge as fundamental elements. As defined by Korf (2007), intermediaries or “brokers” mediate between affected communities and aid providers. Although their role has yet to be extensively explored in the literature, as noted by Kraft and Smith (2019), the importance of these intermediaries lies in facilitating effective cooperation among donors, international organizations, and local organizations, thereby ensuring a coordinated and effective response.

In line with this perspective, Green (2015) suggests that large donors could benefit by adopting more distant approaches, namely by *supporting intermediaries* that can better develop local networks and adapt to changing circumstances. This approach underscores the critical role of intermediaries in fostering collaboration between different levels of actors, reinforcing the need for a humanitarian response that recognizes and capitalizes on local knowledge. For instance, Kraft and Smith (2019) examined in their study the essential role of faith-based organizations as intermediaries in the local implementation of humanitarian aid for Syrian refugees in Lebanon and Jordan. Through detailed interviews, Kraft and Smith revealed the complex influence of these intermediaries on crucial aspects such as the language, quality, and reach of community assistance. Additionally, Fast (2019) identified that intermediaries serve as connection channels, facilitating collaboration between donors and local organizations. Beyond this, they act as capacity builders, transferring knowledge to local actors and serve as hosts for smaller organizations. They also function as strategic bridges, facilitating the rapid allocation of funds. Their function as negotiators and intermediaries highlights their role in civil protection.

2.2 Social network theory and analysis in humanitarian response

Sinnema et al. (2023), based on several studies in the field of social network research, have summarized five fundamental assumptions that provide an essential theoretical framework. This framework is a key for understanding the dynamics and impact of social network in various contexts. Firstly, they focus on sets of *actors* and the *relationships* that link them, offering a holistic perspective on the connections between individuals and entities. Secondly, they presuppose that actors are interdependent and interconnected. Thirdly, they conceptualize the *relationships* between actors as “ties,” highlighting their role in facilitating the exchange of resources. Fourthly, they recognize that the network structure, defined by relational ties, influences the flow of resources within a system, thus emphasizing the importance of arranging these connections. Finally, they view network structures as opportunities and constraints for individual and collective action, providing a comprehensive understanding of how these dynamics affect social behavior. Collectively, this set of assumptions forms a robust conceptual framework, guiding the study of social networks and their impact on resource exchange and social action.

SNT, in the context of humanitarian aid, is explored by Stephenson (2005), who proposes a vision in which organizations offering aid are connected closer and more coordinated, forming

a collaborative network that facilitates a more effective and efficient response in emergencies. In this context, connections are established between various actors within the humanitarian supply chain, such as non-governmental organizations (NGOs), United Nations (UN) agencies, donors/suppliers, and local communities.

According to Seybolt (2009), the quality of response to environmental demands within this system of humanitarian organizations is determined by the interaction between organizational structure and operational processes. A key finding reveals that the humanitarian system tends to become more effective as it adopts network characteristics, achieving this through the goal-focused behavior of the aid community organizations. This study demonstrates that as groups of organizations learn to coordinate more closely at the operational levels, these network characteristics are significantly developed in the system.

It is noted that Social Network Theory (SNT) departs from a qualitative perspective. Complementing this, SNA offers a quantitative perspective, significantly expanding the theory of social networks in humanitarian aid studies through its methodological approach.

SNA examines social structures and relationships, representing them as connections within the network (Scott and Carrington, 2014). This approach involves graphical representations and metrics to perform a comprehensive analysis, as detailed in various studies (Borgatti et al., 2018; Chaudhary and Radhakrishna, 2018; Tabassum et al., 2018; Kumar Chaudhary and Warner, 2021). In these visual representations, network actors are depicted as nodes, while relationships are shown as arcs or “ties” (Borgatti et al., 2018).

Although SNA is not a new method (Zhang, 2010), it is considered a relatively underexplored area in migration studies (Bilecen et al., 2018; Adcox, 2021). Recently, SNA has been applied in various ways: to understand how migrants build relationships in host communities (Bilecen et al., 2018; Adcox, 2021), to facilitate content analysis of migration-related sentiments (Aktuna and Bahar-Özvaiş, 2023; Subay and Gökalp, 2023); to examine how migrant networks have evolved (Ryan and D’Angelo, 2018); and in migrant community integration (Snel et al., 2021).

Network configuration plays a role in the effectiveness of the response. Despite the importance, the structure, and dynamics of interactions between actors responding to humanitarian crises, especially in migrant and refugee situations, have received less attention. Quantitative empirical research is scarce (Tacheva and Simpson, 2019). One recent study conducted in southeastern Iran focused on inter-organizational relationships. It examined the collaborative networks among parties involved in providing malaria-related services to migrants and refugees (Jamshidi et al., 2019). Similarly, another study in Afghanistan, showed affinity among humanitarian agencies. This research introduced a new metric for assessing these agencies through network analysis (Tacheva and Simpson, 2019).

Clark et al. (2021) combined network science, resilience, and international relations theory to analyze humanitarian financial transactions in Greece and Colombia using SNA. Their findings highlighted distinctive network characteristics, providing valuable quantitative insights into adaptability in humanitarian response to migration. These insights are crucial for enhancing the effectiveness of such interventions. In a more recent study, Balbone et al. (2022) utilized SNA to examine the dynamics of humanitarian

response in Burkina Faso, focusing on the connections between education and protection efforts during emergencies. Their analysis revealed mixed results in coordination effectiveness, with only a few organizations having extensive networks and significant centrality to state services. The study also identified areas for improvement, emphasizing the need for more connections between humanitarian organizations, particularly in protection and education sectors.

SNA is a valuable method in humanitarian aid, especially in situations of forced migration in host countries, where state responses and international cooperation are limited (Cachia and Holgado Ramos, 2020). This approach can illustrate the dynamics of humanitarian response by identifying key actors to facilitate coordination. It also assesses cooperation by revealing the nature and strength of connections between different entities. Furthermore, SNA enables the identification of underserved sectors, redundancies, and gaps in cooperation, which are crucial to improving the effectiveness of the response.

3 Data and methods

We employed a mixed-method approach for data collection and analysis in our study. We conducted interviews to establish a sample of organizations involved in the humanitarian response, their activities, and with whom they work. We used this sample to map a network of actors using manual web scraping comprehensively. SNA was applied to analyze the collected data, employing metrics and statistics to provide insights into the network’s structure and dynamics. The combination of interviews and web-scraped data gave us a total of 595 nodes.

3.1 Data

3.1.1 Interviews

Between 2020 and 2021, a series of 24 interviews were conducted with various organizations involved in the humanitarian response to the migration crisis in Colombia (Table 1). Using a semi-structured method, the interviews focused on understanding the activities of these organizations, gaining insights into their responses to the crisis, their collaborative efforts, and the coordination mechanisms employed in their activities. Initially, a preliminary group of organizations from different sectors (i.e., government, international and local NGOs) were contacted. Their interviews not only provided valuable information about humanitarian coordination, but also helped identify other key actors in the field of migration response. This strategy resulted in the inclusion of 21 organizations. The initial insights gathered from the interviews, afforded us a broad overview of Colombia’s cooperation dynamics, and guided subsequent Internet searches of other actors responsible for addressing the Venezuelan migration crisis in the country. In addition, the identification of mechanisms of coordination through the interviews enabled a more comprehensive understanding of the humanitarian response.

3.1.2 Web scraping

The web scraping process focused on identifying entities explicitly referenced during the interviews. This stage yielded an

TABLE 1 Interviewed organizations and their classification.

Category of entities	Number of interviews
NGO	6
Government organization	5
Inter-Governmental Organization	2
Venezuelan diaspora-based NGO	5
Mechanisms	1
Others (University)	2

extensive dataset that encompassed the presence of entities on the Web and network connections of these entities. A detailed explanation of each stage of the process is as follows:

1. *Identification of entities*: The first step involves identifying and recording entities mentioned in previous interviews. These entities could be organizations, individuals, or any other relevant entities. All this information is collected and organized in a spreadsheet.
2. *Exploration of related mechanisms*: After identifying the initial entities, the procedure systematically explores related mechanisms. This step includes investigating, through manual web search, how these entities are connected or involved in various collaborations and partnerships. The goal is understanding the relationships between entities in a specific domain or context through mechanisms.
3. *Extensive web research*: Once the initial entities and their related mechanisms are identified, the procedure conducts extensive web research manually. This research aims to gather more detailed information about inter-organizational collaborations and partnerships. This step may involve visiting websites, accessing publicly available data, and gathering relevant information from online sources.
4. *Database format*: A database format is used to ensure thorough documentation of the collected information. It is elaborated using the spreadsheet. This database distinguishes between “source” and “destination” nodes. The “source node” represents the entity where the information originated, meaning it is the entity that provided the information or was mentioned in the context of the interviews. The “destination node” represents the entity involved in the connection or collaboration, as identified in the available information.

It is important to highlight that the qualitative analysis of the interviews allowed us to gather names and details of additional entities involved in the humanitarian response, which were not initially on our radar. This process expanded our scope from the initial 21 organizations to a much larger number, eventually encompassing 595 entities identified through the web scraping process. This significant expansion demonstrates a snowballing effect, where information from one source leads to discovering multiple others.

Moreover, these interviews provided more than just the names of these entities; they offered a deeper understanding of each

organization’s functions, roles, and initial connections. This insight proved crucial for our practical web scraping efforts, enabling a more targeted approach that focused on relevant data closely aligned with the functions and impacts of these entities.

The interviews elucidated also on various cooperation mechanisms among these entities. Understanding how these organizations interact and cooperate was vital in mapping out the network of humanitarian efforts. This knowledge formed a significant component of our web scraping objectives, aiding in visualizing the network’s structure. In addition, the interviews were instrumental in shaping the structure and content of the database, ensuring it accurately reflected the complexities and dynamics of Colombia’s humanitarian response network.

Furthermore, the insights from the interviews guided our online search strategies. They informed us where and what to search for, leading to a more efficient and effective web scraping process. This approach was grounded in firsthand knowledge obtained from the field, ensuring that our web scraping efforts were not merely a random trawl through the internet but a focused, informed, and strategic operation.

In summary, the interviews laid the foundation of knowledge and served as a roadmap for our web scraping strategy. This methodical approach significantly enhanced the quality and relevance of the data collected for our database, illustrating the value of integrating interview insights into the web scraping.

3.2 Methods

We used SNA to establish network interconnectedness using metrics such as Page Rank, Density, and Centrality. This was achieved with the Gephi platform, which facilitated the visualization and examination of the network’s structure and dynamics. Gephi’s capabilities in representing entities as nodes and relationships as edges, along with its advanced filtering and sub-setting features, allowed for a thorough exploration of sub-networks and coordination mechanisms. Applying these analytical metrics within Gephi was instrumental in identifying and quantifying key actors and patterns, leading to a deeper, more nuanced understanding of the relationships in Colombia’s humanitarian response to migration.

We utilized a spreadsheet with the entities’ information collected from the interviews and manual web scraping as the primary database for our SNA. This database was organized into two central sheets: the first sheet listed all the entities, each assigned a unique ID, along with details like organization name, type, and operational areas, considering the specific areas of interest outlined in our study (i.e., humanitarian needs). The second sheet was dedicated to mapping relationships, featuring an origin ID and a target ID for each connection, accompanied by their respective names.

We used Gephi’s undirected arc networks, which were appropriate for this context, as the relationships between entities did not have specified directionality. This method allowed us to observe the network’s structure without presuming the flow of interactions.

3.2.1 Density

This metric quantifies the total count of direct connections associated with a specific node within a network. It offers a straightforward and efficient method for evaluating the node's commitment level and immediate connections (Kim et al., 2021). Network density is computed as the ratio between the number of connections established among nodes and the maximum possible number of connections within the network, providing a comprehensive measure of the network's interconnectedness (Jezovit et al., 2021).

3.2.2 Pagerank

This metric assesses a node's links by considering direction, weight, and connectedness. In traditional humanitarian aid scenarios, connections typically flow in one direction. However, in this specific context, connections exhibit bidirectionality, necessitating the evaluation of the quality of incoming connections to the node (Tacheva and Simpson, 2019).

3.2.3 Betweenness centrality

This metric measures the extent to which a node acts as a connector between two other nodes along the shortest path. It quantifies a node's influence of a node as a connector within the network, determining its control over the flow of resources, information, or other elements. Nodes with high betweenness centrality significantly impact the network, ensuring communication and connectivity (Tacheva and Simpson, 2019).

3.2.4 Eigenvector centrality

This key metric assesses a node's significance within a network. Unlike traditional link-counting metrics, eigenvector centrality evaluates the quantity, quality, and influence of a node's connections. This measure operates on the principle that a node's importance is not solely determined by its direct links, but also by the centrality and impact of its connected neighbors. This recursive effect extends to incorporate centrality and connections of those neighbors. As a result, a node's eigenvector centrality is proportionate to the cumulative eigenvector centrality of all its connected neighbors, providing a nuanced understanding of a node's significance within the overall network structure (Solá et al., 2013).

4 Results

The network analysis provides a characterization of networks in response to Colombia's migration situation. The first characterization is based on the type of entity. The second identifies central mechanisms and intermediaries to the social network. The third is based on the function provided by the identified sub-networks according to the humanitarian needs of migrants and refugees in Colombia. In addition, the analysis of these categories revealed needs that have been underserved.

4.1 Entity type characterization

Entities were categorized based on the nature of the organization and the work areas, focusing on humanitarian needs reported by OCHA (2023). Table 2 provides a summary of the type of entities, number of entities, their definitions, and the classification color used for network analysis. These colors, which correspond to those in the network figures, are utilized to visually identify and differentiate the categories classifying the entities.

Table 2 categorizes entities into seven groups based on their unique characteristics and functions in humanitarian efforts. The information provided by the interviews elucidates these categories, clarifying the roles and interactions of each entity. The following key insights stand out from the knowledge gained through the analysis of the interviews:

1. Several diaspora-based NGOs received guidance from UN organizations on how to become a registered NGO. Note that all NGOs in this table are formally registered. However, some of these were, at a time, grassroots civil societies with no funding but providing a service to the migrant community.
2. Regarding *ad-hoc* NGOs, we could only identify those driven by diaspora. In all interviews, we asked that question. Are there any driven by native Colombians? Interestingly, none of the 24 interviews were identified as Colombian-driven. However, we did find NGOs and universities with Colombian volunteers.
3. International NGOs attract substantial donations from global supporters, allocating these funds through diverse channels or mechanisms.
4. Mechanisms are important strategies in humanitarian response. These mechanisms are coordination strategies that include workspaces or interagency collaborations. It is important to note a prevalent belief among interviewed local NGOs: they perceive organizations participating in these mechanisms as primary donors in humanitarian aid, fostering the notion that involvement in these mechanisms grants greater access to resources. However, it was revealed that while some local NGOs were invited to participate in workspaces, they were not granted membership in the coordination mechanisms. This exclusion has led to a sense of frustration among the members of these local groups.
5. Some of the mechanisms identified from the interviews were the humanitarian NGO forum - Colombia, humanitarian country team (EHP in its Spanish acronym), coalition for the defense of the rights of refugees, migrants and displaced populations in Latin America and the Caribbean (LAC RMD coalition), the interagency group for mixed migration flows (GIFMM in its Spanish acronym), Coalición Por Venezuela and Quito process.
6. It is also notable that UNHCR had a presence in Colombia to aid the internally displaced population (IDP) due to internal conflict. Not just UN agencies, but also other types of organizations, including faith-based organizations, transitioned from serving IDP to migrants.

TABLE 2 Entity categories.

Category of entities	Definition	Classification Color	Number of Entities
NGO	Non-profit organizations independent of government control, operating at both national and international levels, with the primary goal of achieving social aims.	Blue	260
UN- Humanitarian Organizations	Entities affiliated with the United Nations system, contributing to international cooperation, and addressing global challenges.	Yellow	34
Government organization	Entities integral to the Colombian government structure, responsible for implementing public policies and services.	Green	102
Venezuelan diaspora-based NGO	Organizations founded by Venezuelan migrants, dedicated to social objectives, and addressing the needs of the diaspora community.	Black	50
Private companies	Profit-driven organizations focused on selling products or services in the market.	Purple	102
Others	This category encompasses universities, initiatives, and programs with diverse objectives and functions.	Grey	37
Mechanisms	Strategies involving articulation, communication, and coordination, aimed at facilitating effective collaboration and operation.	Red	10

4.2 Central mechanisms and intermediaries

Network analysis provides insights into the mechanisms and intermediaries involved in humanitarian aid in Colombia, offering an understanding of the dynamics at play in this arena. The results are presented in tables and network diagrams. The tables enumerate the metrics—page rank, betweenness centrality, and eigenvector centrality—in a ranked order. This arrangement offers a clear, quantitative perspective of each entity's relative importance. Complementing this, the figures visually depict these metrics. Within these network diagrams, the size of each node is proportional to its metric value, facilitating the easy identification of the more influential entities in the network at a glance.

In reference to the results provided by the PageRank metric, Table 3 presents the top five entities in the humanitarian aid network with their corresponding scores: (1) Ya estoy online: An initiative of the Colombian Chamber of Commerce, which aims to support entrepreneurship; (2) Mercy Corps: An international NGO that focuses on achieving the Sustainable Development Goals (SDGs) by providing humanitarian aid, thus addressing global challenges through various relief efforts; (3) Humanitarian Country Team (HCT): a forum for strategic and operational decision-making and oversight in humanitarian activities, coordinating efforts between different organizations; (4) Medglobal: An international NGO that offers humanitarian aid across various countries, with a particular emphasis on healthcare services; and Humanitarian Round Table (HRT): a platform, led by the International Labor Organization and Universidad del Externado, that establishes vital communication links between different entities through workshops, enhancing collaboration and information exchange in the humanitarian sector.

The observed PageRank scores for these organizations are notably low, nearly approaching zero. This finding is in line with the overall network density, which is a mere 0.006. Compared to other studies, the network's Density is exceptionally low. As highlighted by Xing and Ghorbani (2004), this suggests that the network has significantly fewer relationships than what its number of nodes would allow. In other words, while there are many

TABLE 3 Top five of entities with the highest PageRank.

	Entity	PageRank
1	Ya Estoy online	0.035
2	Mercy corps	0.028
3	Humanitarian country team (HCT)	0.024
4	Medglobal	0.023
5	Humantarian round table (HRT)	0.021

organizations within the humanitarian aid sector in Colombia, the level of interconnectivity and coordination among them is lower than expected. Moreover, some organizations are completely isolated, not connecting with others at all.

Figure 1 also displays the entities with the highest PageRank in the network. Here, three types of categories stand out: one governmental (i.e., Ya estoy en Online), two international NGOs (i.e., Medglobal and Mercy Corps), and four coordination mechanisms (i.e., GIFMM, Coalición por Venezuela, HCT, and HRT).

Our analysis highlights the significant interconnectedness of specific mechanisms within the network, as evidenced by the dense lines connecting the red nodes. Although these mechanisms represent only a low 1.65% of all nodes, these mechanisms play a crucial role in the structure and functioning of the humanitarian aid network. This underscores their importance, despite their small number.

Conversely, Table 4 presents the top five entities with the most significant connections, as determined by the eigenvector metric. These include: (1) The Interagency Group on Mixed Migratory Flows (GIFMM), co-led by IOM and UNHCR; (2) the Humanitarian Country Team (HCT); (3) HIAS, an International NGO specializing in protection, mental health, and emergency response; (4) UNHCR, the United Nations agency focused on global refugee protection; and (5) De Pana Que Sí, a Venezuelan diaspora-based NGO committed to empowering Venezuelan migrants and Colombian returnees.

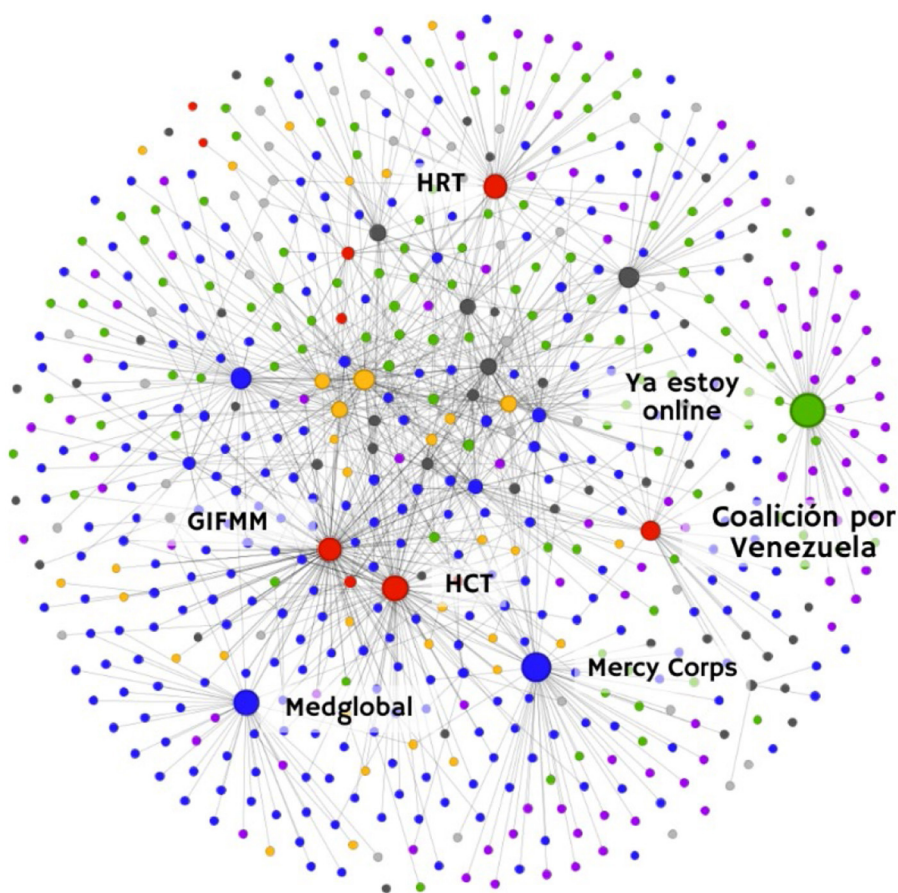


FIGURE 1
Network PageRank analysis.

TABLE 4 Top five of the entities with the highest eigenvector centrality.

	Entity	Eigenvector centrality
1	GIFMM	1.0
2	Humanitarian country team (HCT)	0.66
3	HIAS	0.45
4	UNHCR	0.42
5	De Pana Que Sí	0.35

Unlike page rank, eigenvector analysis highlights the relevance of each node’s connection based on the entities to which they are connected. This works as a cascade effect, where the significance of the nodes an entity is connected to directly impacts the importance of its own connections.

In contrast to the PageRank graph shown in Figure 1, the eigenvector analysis graph in Figure 2 displays entities with significant edges or connections, illustrating a different aspect of the network relationships.

The graph highlights GIFMM and the Humanitarian Country Team (HCT) as key mechanisms within the network. Notably, HCT stands out not only due to its highest number

of connections but also for the superior quality of these connections. This pattern emphasizes the leadership position of such mechanisms, reinforcing their role as critical nodes of interaction and coordination within the humanitarian aid network.

From another perspective, the betweenness centrality metric complements the findings obtained through the PageRank and Eigenvector metrics. Table 5 lists the top five entities with an intermediary role, as indicated by the statistics of betweenness centrality. These include entities described before, such as GIFMM, UNHCR, HCT, and Mercy Corps. In addition, Brisas del Norte, a diaspora-based NGO offering humanitarian aid, emerges as a key intermediary in the network.

Figure 3 illustrates that various categories of entities, including mechanisms, diaspora-based NGOs, UN organizations, and NGOs, function as intermediaries in the network. Some entities, such as “Ya estoy online” in the “government” category, connect only within their own category. In contrast, others, like GIFMM and HCT in the “mechanisms” category, are connected across all categories. However, it is noteworthy that the categories “private companies” (represented by purple nodes) and “other categories” (represented by gray nodes) also feature in this graph. This diversity highlights the various types of intermediaries present in the network.

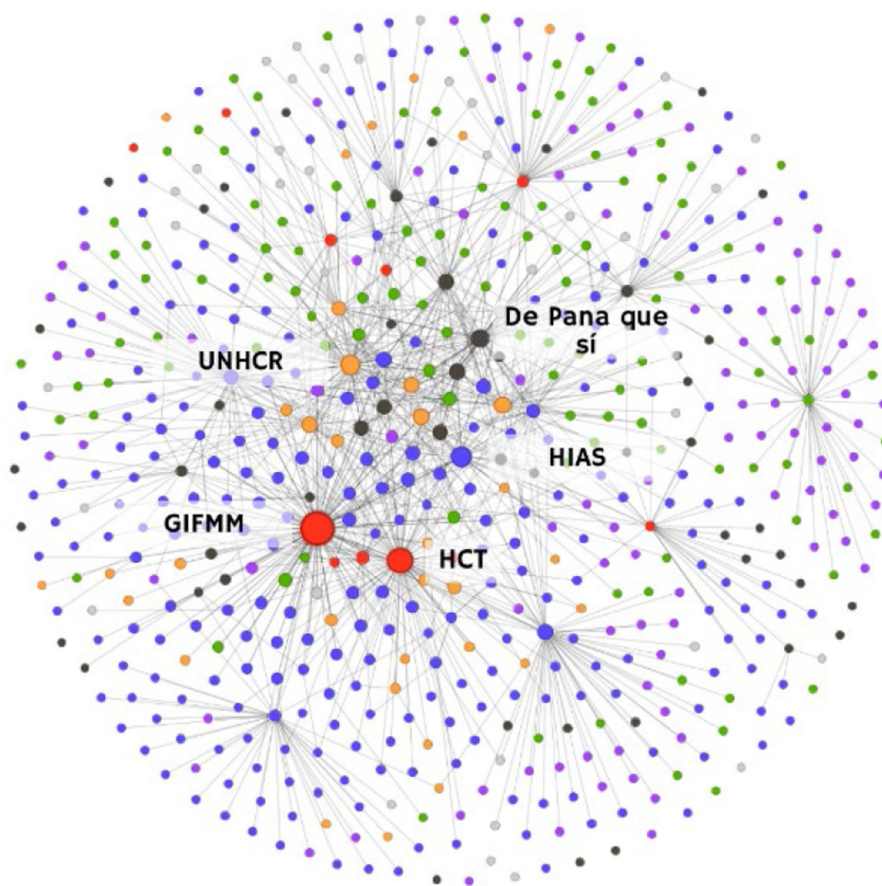


FIGURE 2
Network eigenvector analysis.

TABLE 5 Top five of the entities with the highest betweenness centrality.

	Entity	Betweenness centrality
1	GIFMM	37302.429
2	Brisas del Norte	34046.008
3	UNHCR	31127.736
4	Humanitarian country team (HCT)	26231.950
5	Mercy Corps	25205.010

A significant observation from our analysis is that in Colombia’s humanitarian aid network for migrants and refugees, the role of an intermediary is characterized by the results of the betweenness centrality metric. A range of entities—both organizations or mechanisms—serve as intermediaries, coordinating activities and facilitating aid distribution. GIFMM stands out as a crucial mechanism, uniquely positioned as a facilitating intermediary that plays a central role in the coordination function within the network.

4.3 Sub-networks according to the humanitarian needs

According to UNHCR (2023), protection involves a set of activities aimed at ensuring equal access to and enjoyment of the rights of women, men, girls, and boys.

A significant portion of entities in the network, amounting to 43.97%, provides services in *protection*, accounting for 18.69% of the total connections. Tables 6, 7 present the PageRank and Eigenvector centrality for the top five organizations. Table 6 shows that the entities with the most connections are: (1) Mercy Corps, an international NGO; (2) De Pana Que Sí, a Venezuelan diaspora-based NGO; (3) UN Women, the UN organization focused on gender equality and women’s empowerment; (4) the World Food Program (WFP), a UN organization dedicated to nutrition improvement, supporting small farmers, addressing climate crises, and enhancing human capital through school feeding programs; and (5) the International Organization for Migration (IOM), a UN organization promoting orderly and humane migration management and international cooperation.

Conversely, Table 7, which focuses on eigenvector centrality, highlights “De Pana Que Sí,” as having the most significant connections. This organization is followed by IOM, Mercy Corps,

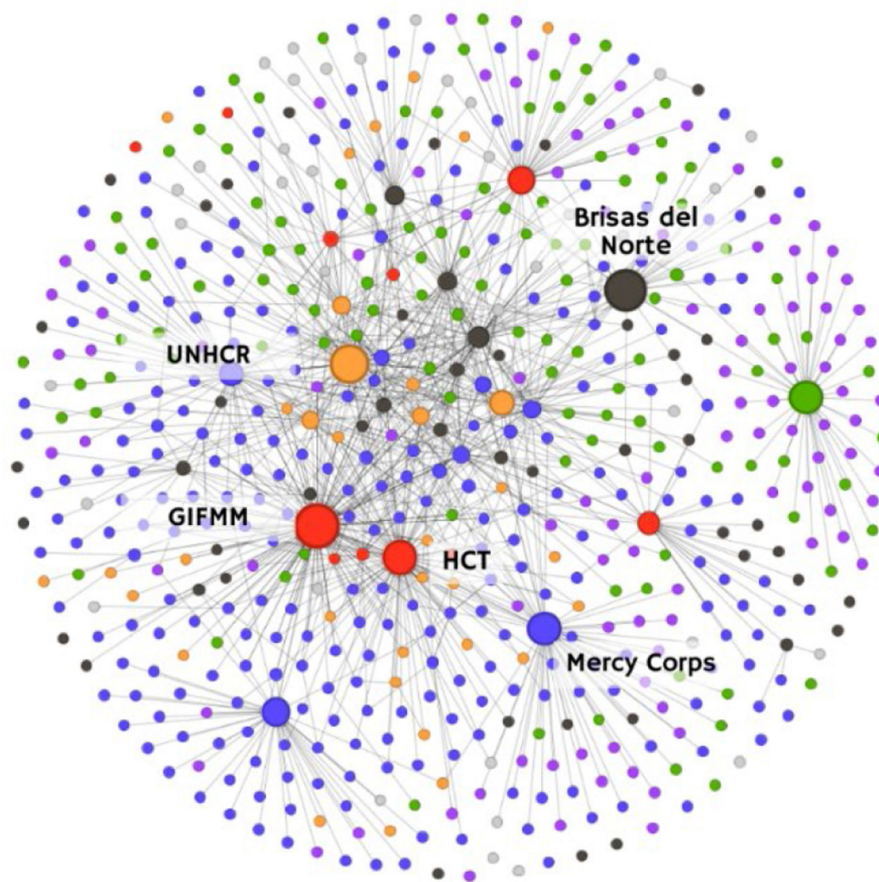


FIGURE 3
Network betweenness centrality analysis.

TABLE 6 Top five of the entities with the highest PageRank in the Protection Network.

	Entity	PageRank
1	Mercy Corps	0.052
2	De Pana Que Sí	0.041
3	UN Women	0.036
4	WFP	0.034
5	IOM	0.026

and UN Women. USAID, an international NGO funded by the US government for humanitarian aid, is also ranked as one of the entities with the most important connections within the protection network.

Despite their abundance in the protection work area, Figures 4, 5 reveal that government entities (represented by green nodes) are not the most influential according to PageRank and eigenvector centrality metrics. These government organizations also exhibit limited connectivity with other groups and among themselves. In contrast, Venezuelan diaspora-based NGOs (represented by black nodes, for example, De Pana Que Sí) and predominantly international NGOs (represented by blue nodes, such as Mercy Corps) maintain numerous and significant connections within the

TABLE 7 Top five of the entities with the highest Eigenvector Centrality in the Protection Network.

	Entity	Eigenvector centrality
1	De Pana Que Sí	1.0
2	IOM	0.606
3	USAID	0.444
4	Mercy corps	0.426
5	UN Women	0.387

protection network. UN agencies (represented by yellow nodes), including UN Women and IOM, are notable for their numerous and substantial connections. Therefore, the protection network is characterized by three main categories of contribute valuable coordination: Venezuelan diaspora-based NGOs, International NGOs, and UN Organizations.

4.3.1 Education

In the network, 23.8% of entities provide services in *education*, but only 5.09% of total network connections are associated with this sector.

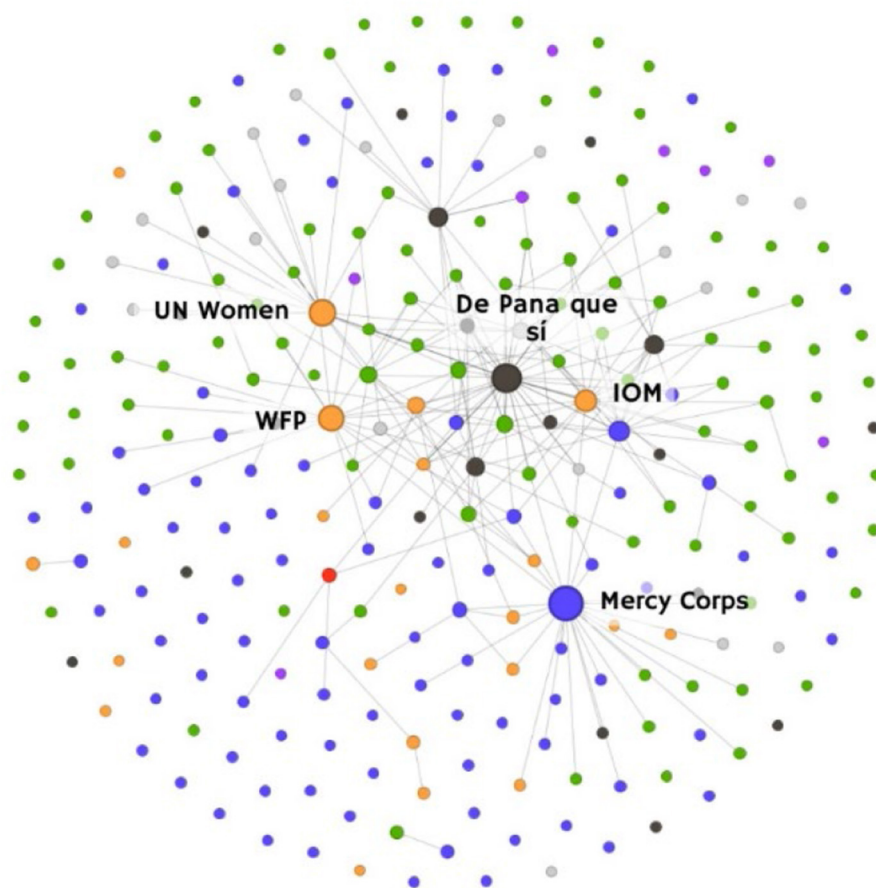


FIGURE 4
Protection network based on PageRank metric.

Tables 8, 9 display the PageRank and Eigenvector centrality for the top five organizations in the education sector. According to Table 8, the most connected entities are: (1) Scalabrini International, a global religious NGO providing humanitarian assistance; (2) the World Food Program (WFP); (3) De Pana Que Sí; (4) Mercy Corps; and (5) Brisas del Norte. Moreover, Table 9 highlights “De Pana Que Sí” as the Venezuelan diaspora-based organization with the most significant connections in education, followed by Scalabrini International and WFP. In fourth place is ICBF, a government entity noted for its significant connections. Mercy Corps also appears in the ranking. Brisas del Norte does not appear in this ranking, as its numerous connections are less significant compared to others.

Figures 6, 7 illustrate that while NGOs (represented by blue nodes) are notably present in the humanitarian network, their overall connectivity in the education sector is limited, with only a select few NGOs have significant connections. In contrast, Venezuelan diaspora-based organizations (represented by black nodes) play a pivotal role in coordinating educational responses. Together with international NGOs (represented by blue nodes) and UN organizations (represented by yellow nodes), they form the group with the most connections in the network. Government entities (represented by green nodes), generally less prominent in this sector, have an exception in ICBF, which stands for its significant connections. This distribution highlights the

varied impact of different categories within the humanitarian education sector.

4.3.2 Integration

Integration refers to promoting the socioeconomic inclusion of refugees and migrants from Venezuela, considering aspects such as gender, age, and diversity to contribute to sustainable local development and social cohesion (R4V, 2022).

In the network, 33.06% of entities provide services in *integration*. However, only 11.54% of total network connections are associated with this sector. Tables 10, 11 showcase the PageRank and Eigenvector centrality metrics with the top five organizations in the integration sector. According to Table 10, the entities with the most connections are: (1) Mercy Corps, (2) IOM, (3) USAID, (4) Brisas del Norte, and (5) De Pana Que Sí. This ranking is consistent with the analysis of the most significant connections in Table 11, except for the Venezuelan diaspora-based organization Brisas del Norte, which loses its prominence due to less significant connections. Notably, the Local Integration Center for Migrants-Barranquilla, a government category entity, stands out for having fewer but more significant connections.

The observations are further validated by Figures 8, 9. However, the network diagrams reveal that many NGOs have

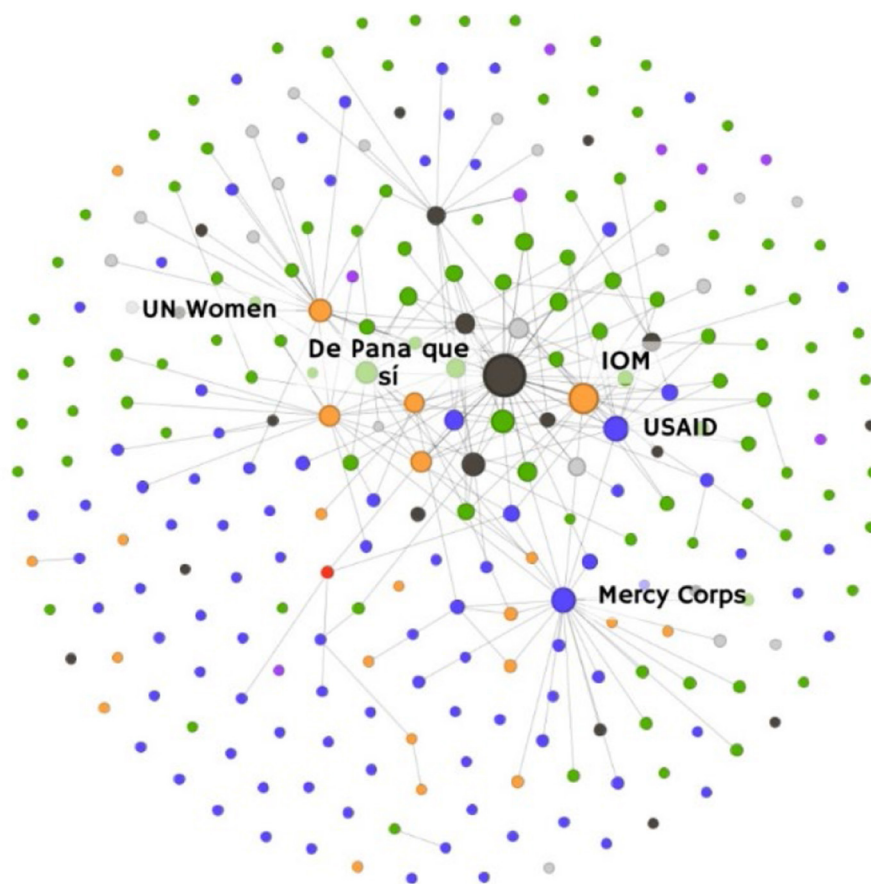


FIGURE 5 Protection network based on eigenvector centrality metric.

TABLE 8 Top five of the entities with the highest PageRank in the Education Network.

	Entity	PageRank
1	Scalabrini International	0.07
2	WFP	0.068
3	De Pana Que Sí	0.059
4	Mercy corps	0.053
5	Brisas del Norte	0.023

TABLE 9 Top five of the entities with the highest Eigenvector Centrality in the Education Network.

	Entity	Eigenvector centrality
1	De Pana Que Sí	1
2	Scalabrini International	0.673
3	WFP	0.659
4	ICBF	0.533
5	Mercy Corps	0.513

few or insignificant connections, indicating a need for improved coordination among these entities. Additionally, there is a notable increase in the presence of private companies (represented by purple nodes) in this sector, more so than in the other areas previously discussed.

4.3.3 Health

In the network, 22.15% of entities provide *health* services. However, only 4.92% of total network connections are associated with this sector. Table 12 displays the PageRank metrics with the top five organizations in the *health* sector. The entities with the

most connections are (1) Medglobal, (2) Red somos, a Venezuelan diaspora-based NGO with a focus on sexual education, primary care, and psychological support, (3) De Pana Que Sí, (4) Brisas del Norte, and (5) Medical Teams International, an international NGO offering a variety of healthcare services.

Unlike other sectors such as education, protection, and integration, eigenvector centrality metrics are not provided in the *health* sector. Figures 10, 11 show that Medglobal is the only prominent entity in this sector.

The network also highlights many NGOs with limited or insignificant connections, suggesting a need for improved

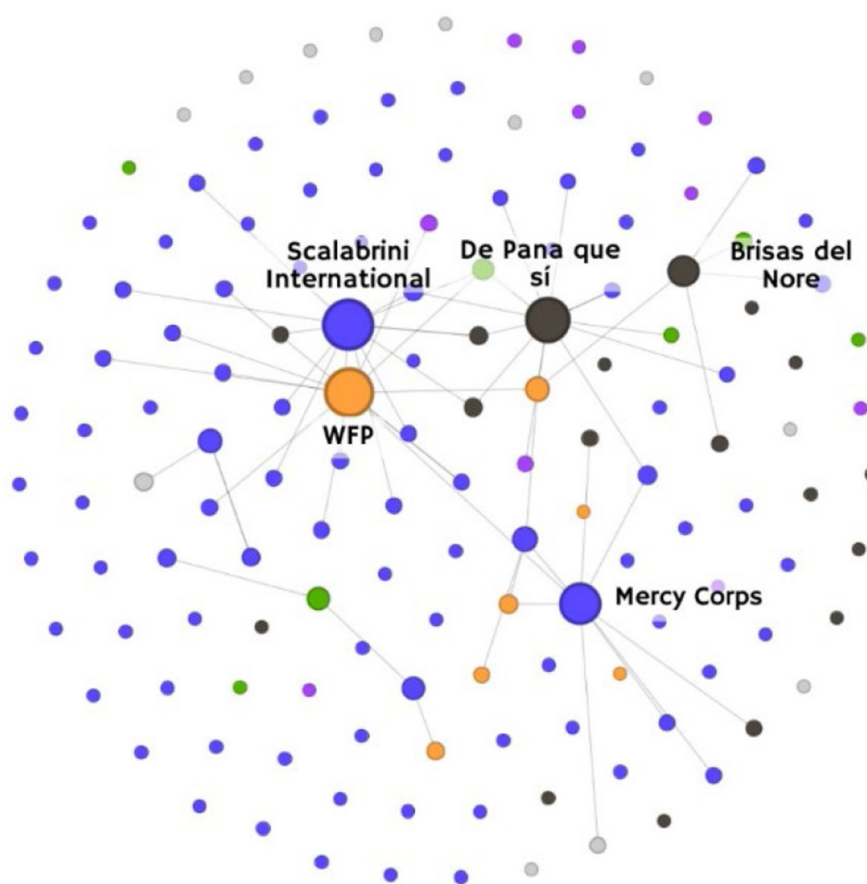


FIGURE 6
Education network based on PageRank metric.

coordination. Venezuelan diaspora-based NGOs are also involved but with fewer and less significant connections compared to other sectors. Private companies (represented by purple nodes) have a minimal presence, mainly through health service-providing institutions (IPS). These entities do not interconnect, but they do coordinate with Medglobal in some instances.

4.3.4 Food security and nutrition

In the *food security and nutrition* sector, 13.88% of the entities from the entire network address these needs, representing 2.63% of the total network connections. Tables 13, 14 showcase the PageRank and Eigenvector centrality metrics with the top five organizations in this sector. According to Table 13, the entities with the most connections are: (1) WFP, (2) Scalabrini International, (3) De Pana Que Sí, (4) UNICEF, a UN organization that defends the rights of children and adolescents, and (5) Brisas del Norte. On the other hand, Table 14 shows the top five entities with the most relevant connections: (1) WFP, (2) UNICEF, (3) ICBF, (4) De Pana Que Sí, and (5) Scalabrini International.

Tables 13, 14 reveal comparable outcomes, except for the organization Brisas del Norte, which does not rank among those

with the most significant relationships. Notably, this analysis marks the first significant appearance of UNICEF, highlighted by its significant connections.

Figures 12, 13 indicate that the network in the *food security and nutrition* sector primarily consists of NGOs, private companies, Venezuelan diaspora-based organizations, and government institutions. Compared to the networks in integration, education, and health, the *food security and nutrition* network exhibits fewer connections and a smaller proportion of significant ones. This aspect suggests a fundamental need within this sector that requires better coordination and attention.

4.3.5 Housing and settlements

Due to the limited connections in the *housing and settlements* sector, no PageRank or Eigenvector centrality metrics are reported for it. Unlike the other work areas previously discussed, this sector exhibits fewer entities and categories, involving only 3.14% of the network's entities. Although not all entities are interconnected, the seven that are connected form a closed network. This is indicated by the continuous lines of edges, suggesting a smooth flow of information among them. For more details, refer to Supplementary Figure 14.

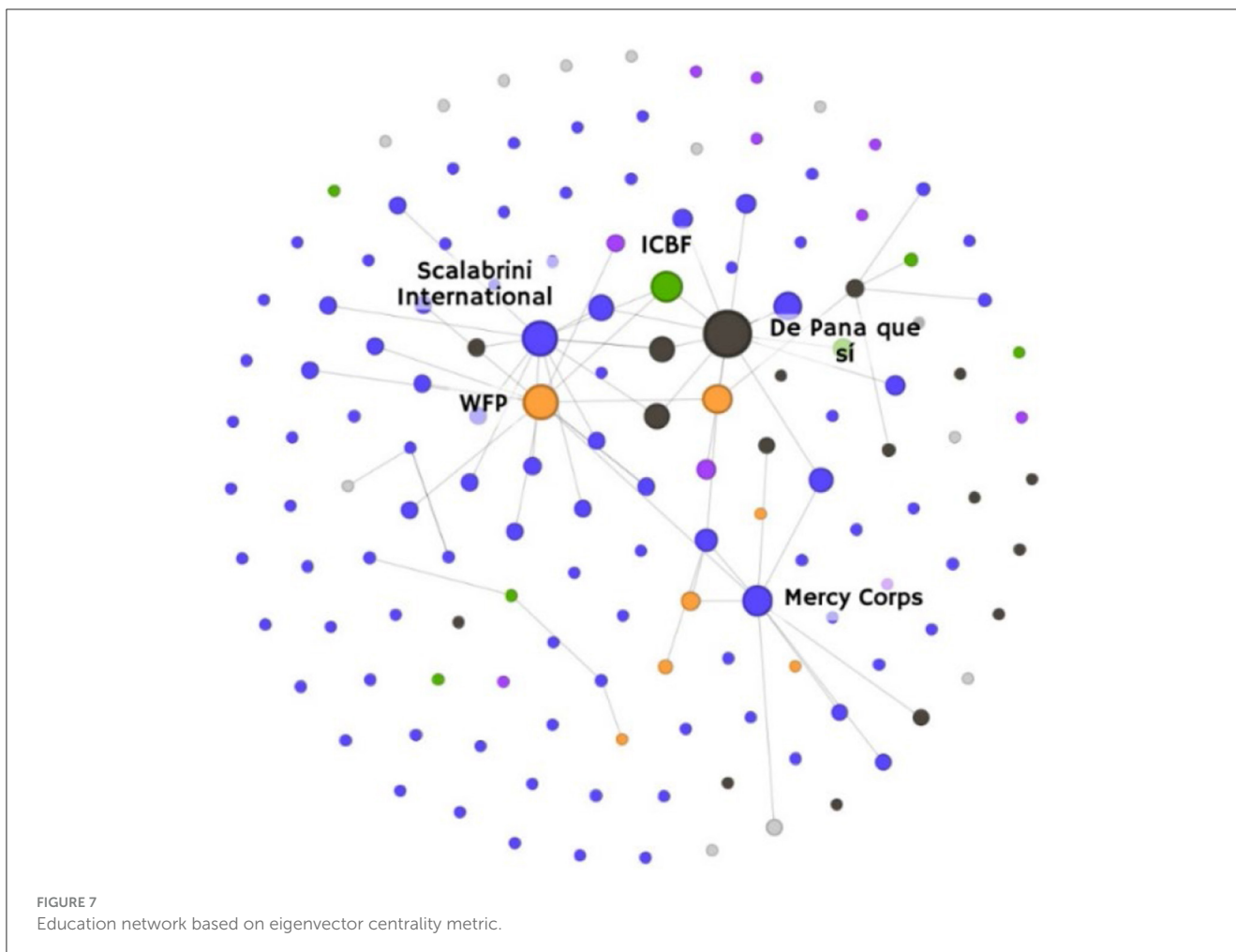


TABLE 10 Top five of the entities with the highest PageRank in the Integration Network.

	Entity	PageRank
1	Mercy Corps	0.068
2	IOM	0.054
3	USAID	0.046
4	Brisas del Norte	0.034
5	De Pana Que Sí	0.032

Notably, this sector is notably less active than others, with only a handful of organizations, predominantly NGOs, directing their efforts here. However, there is a lack of coordination among these few organizations, indicating a need for improved collaborative efforts.

4.3.6 Humanitarian transportation

This sector is one of the least served in the realm of humanitarian aid with only a mere 0.66% of the entities involved in transportation. Among the four organizations addressing this need, there are no connections, with participation limited to NGOs

TABLE 11 Top five of the entities with the highest Eigenvector Centrality in the Integration Network.

	Entity	Eigenvector centrality
1	IOM	1
2	De Pana Que Sí	0.88
3	USAID	0.74
4	Mercy corps	0.59
5	Local integration center for migrants - Barranquilla	0.51

and one Venezuelan diaspora-based NGO participating. For more details, refer to [Supplementary Figure 15](#).

4.3.7 Water, sanitation, and hygiene response

Network analysis shows that only 7.11% of entities are involved in assistance with water, sanitation, and hygiene, accounting for just 0.17% of total network connections. Interviews with various organizations revealed a significant trend: many migrants reside in informal settlements characterized by inadequate land conditions and a lack of basic amenities such as sanitation, water services,

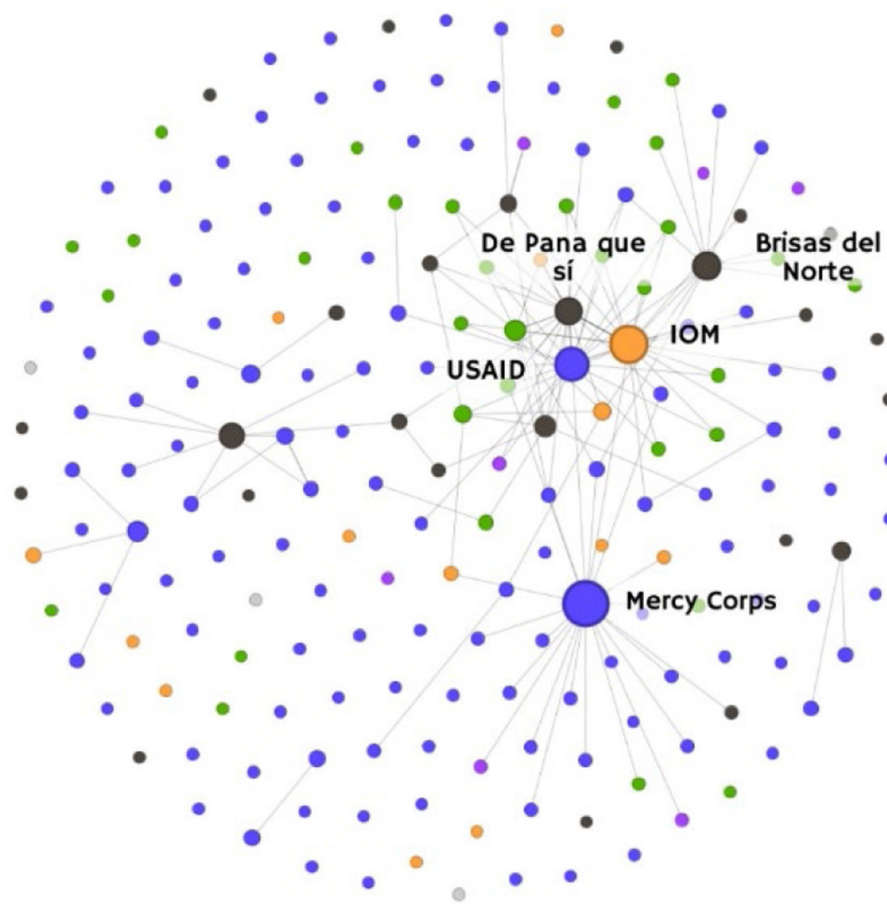


FIGURE 8
Integration network based on PageRank metric.

and toilet facilities. Notably, it is predominantly NGOs that are providing most of the assistance in these challenging environments. For more details, refer to [Supplementary Figure 16](#).

5 Discussion and final remarks

This section presents the findings and final remarks from our analysis of Colombia's humanitarian aid network. Through this discussion, we aim to provide insights into enhancing the effectiveness of humanitarian responses.

The start of our study with semi-structured interviews provided an essential foundation for understanding the primary actors, cooperation mechanisms, and work areas within Colombia's humanitarian landscape. This initial step was crucial in gathering the necessary information to construct and subsequently analyze the cooperation networks. Our investigation began with 21 organizations, which, through further web-based research, expanded to the identification and classification of 595 entities, actors, and mechanisms. The interviews did more than identify these entities; they offered a deeper understanding of each organization's function, role, and classification within various categories. Furthermore, these discussions revealed the pivotal role

of coordination mechanisms—critical elements in mapping the network of organizational interactions. These mechanisms, which include workspaces and interagency collaborations, were integral to our network analysis. In conjunction with our SNA findings, we articulate the following key insights:

Network structure and diversity: Analyzing Colombia's humanitarian network reveals a complex system comprising diverse organizations. This network primarily consists of local and international NGOs, government agencies, and private companies. Additionally, it includes UN humanitarian agencies, Venezuelan diaspora-based NGOs, religious organizations, universities, and more. Each category brings unique knowledge and resources, contributing distinctively to the humanitarian response. This diversity, revealed initially through the interviews, underlines the network's multifaceted nature and potential for comprehensive humanitarian aid, through the unique contributions of each entity type.

Challenges in connectivity and local involvement: A critical finding is the network's low density, indicating limited interconnectivity among organizations. Despite numerous active entities, stronger interconnectedness is needed to enhance efficiency and effectiveness of the humanitarian response. Government agencies and the private sector need a higher

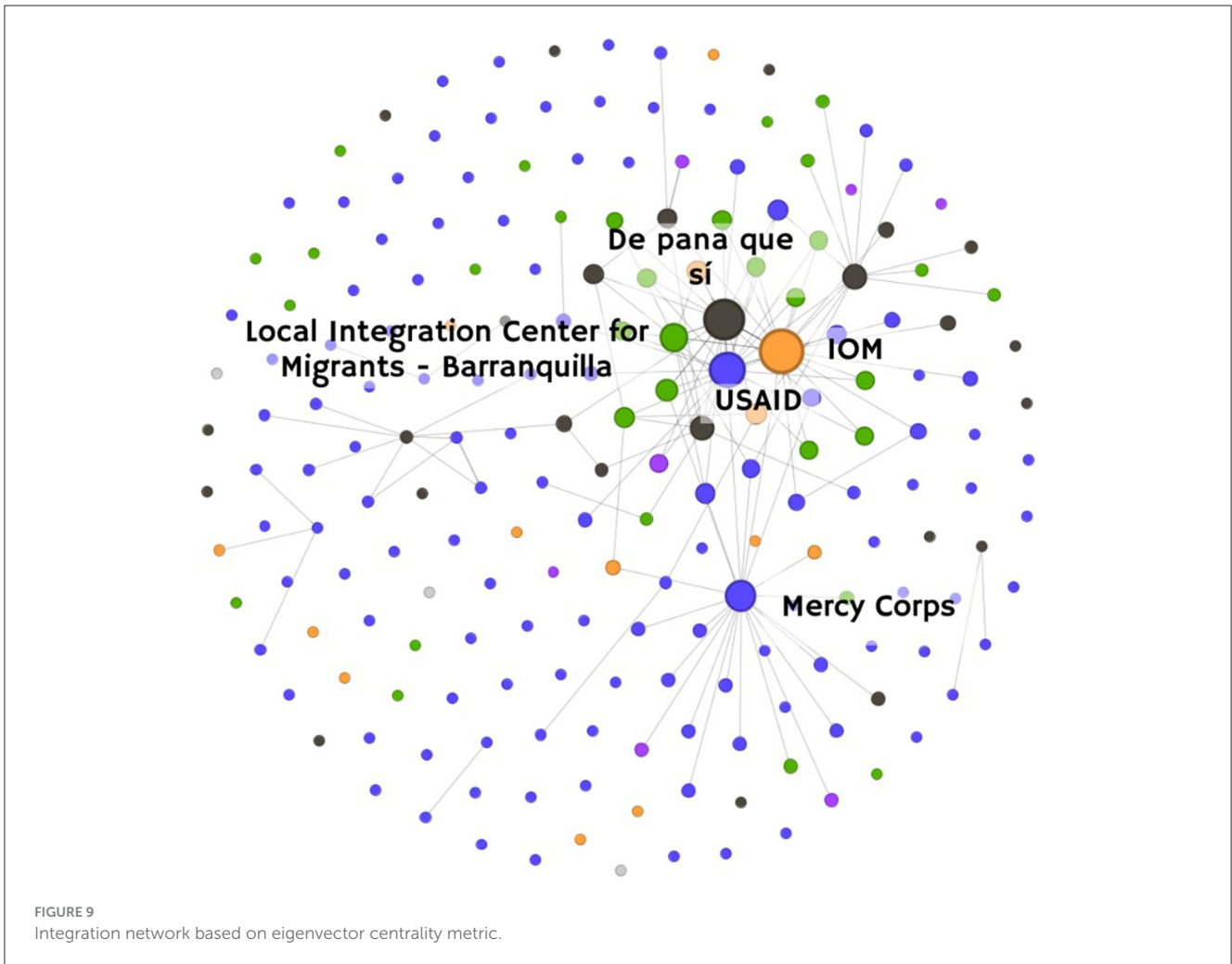


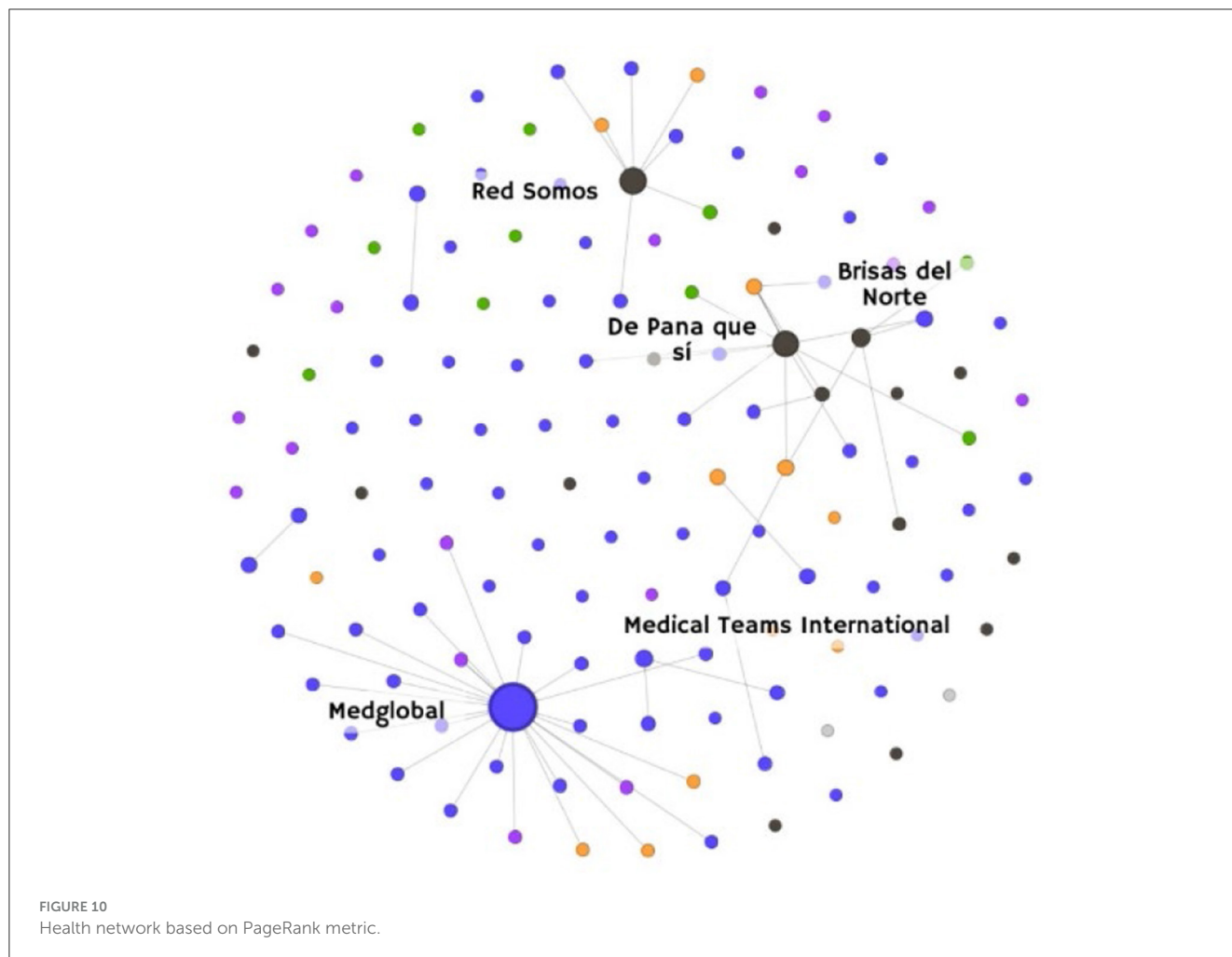
TABLE 12 Top five of the entities with the highest PageRank in the Health Network.

	Entity	PageRank
1	Medglobal	0.13
2	Red Somos	0.052
3	De Pana Que Sí	0.05
4	Brisas del Norte	0.023
5	Medical teams international	0.02

level of connectivity, especially in specific key humanitarian sectors. This result suggests that their participation and integration with other actors could be improved despite their presence and number in the network. Furthermore, the predominance of local Venezuelan diaspora-based NGOs and the absence of Colombian-led organizations point to a gap in local representation. This discrepancy, initially identified through the interviews and confirmed through the web search of more actors and organizations, suggests an urgent need for increased local community involvement in leading and managing humanitarian efforts.

Role of coordination mechanisms: Coordination mechanisms, although limited in number within the categories in the network, are fundamental to Colombia’s humanitarian network. Entities such as the Interagency Group on Mixed Migratory Flows (GIFMM), the Humanitarian Country Team (HCT), and the Humanitarian Roundtable (HRT) played a crucial role in structuring and operating this network. These mechanisms not only bring the various entities together for effective collaboration, they also work on improving efficient operations. We support these findings based on the PageRank and Eigenvector metrics, which underscore mechanisms’ prominent and leading position in the network. The significance of these mechanisms is reflected in their broad connectivity and the nature of their relationships.

Inclusion in coordination mechanisms: The inclusion of diverse actors, particularly from the Venezuelan diaspora, in coordination mechanisms is crucial. Despite their active participation, a sense of exclusion was evident during the interviews, pointing to the need for better integration in decision-making processes. This insight informed our understanding of the need for more inclusive coordination mechanisms to ensure a representative and effective humanitarian response. Addressing these inclusion



challenges is crucial for a more representative and effective humanitarian response.

Intermediary roles and contributions: Intermediaries play a pivotal role in Colombia's humanitarian aid network, serving as key mediators and connectors. Organizations like GIFMM, UNHCR, HCT, Mercy Corps, and Brisas del Norte exemplify this role by bridging diverse entities, thereby aiding coordination, resource allocation, and strategic decision-making. This critical function aligns with what Korf (2007) emphasized on their role in ensuring effective and coordinated responses within the humanitarian framework.

The network's strength lies in the diversity of its intermediaries, which includes Venezuelan diaspora-based organizations, various NGOs, UN agencies, and other mechanisms. Notably, GIFMM and HCT stand out for their dual roles as both mechanisms and key intermediaries. This variety not only adds complexity and breadth to the network, but also enriches it, enabling a more holistic and adaptable approach to humanitarian assistance that can meet various needs and situations.

Echoing Fas's (2019) description, these intermediaries act as catalysts for collaboration, capacity builders, and strategic connectors, a role clearly evident in Colombia's context. For instance, actors like UNHCR play a multifaceted role,

demonstrating the effectiveness of intermediaries in enhancing the network's overall functionality and impact.

The role of Venezuelan diaspora-based NGOs: The interviews highlighted the role of these organizations, and their evolution from grassroots civil societies to formally registered NGOs, were also key insights that informed our initial understanding. In addition, the SNA results reveal that Venezuelan diaspora-based NGOs in Colombia, numbering 50 entities, are critical players in the humanitarian network. They not only provide direct aid to address the Venezuelan migrant community's diverse needs but also promote social integration and development within the Colombian host community.

These organizations engage in various humanitarian areas, including protection, education, health, and integration, showcasing their commitment to addressing the complex challenges migrants face. They are particularly effective in coordination and networking, with entities like "De Pana Que Sí" making significant connections that shape the humanitarian response.

Transforming from grassroots civil societies to formally registered entities, often guided by UN organizations, these NGOs have made remarkable strides. Despite facing challenges such as limited resource access and coordination barriers, they play a

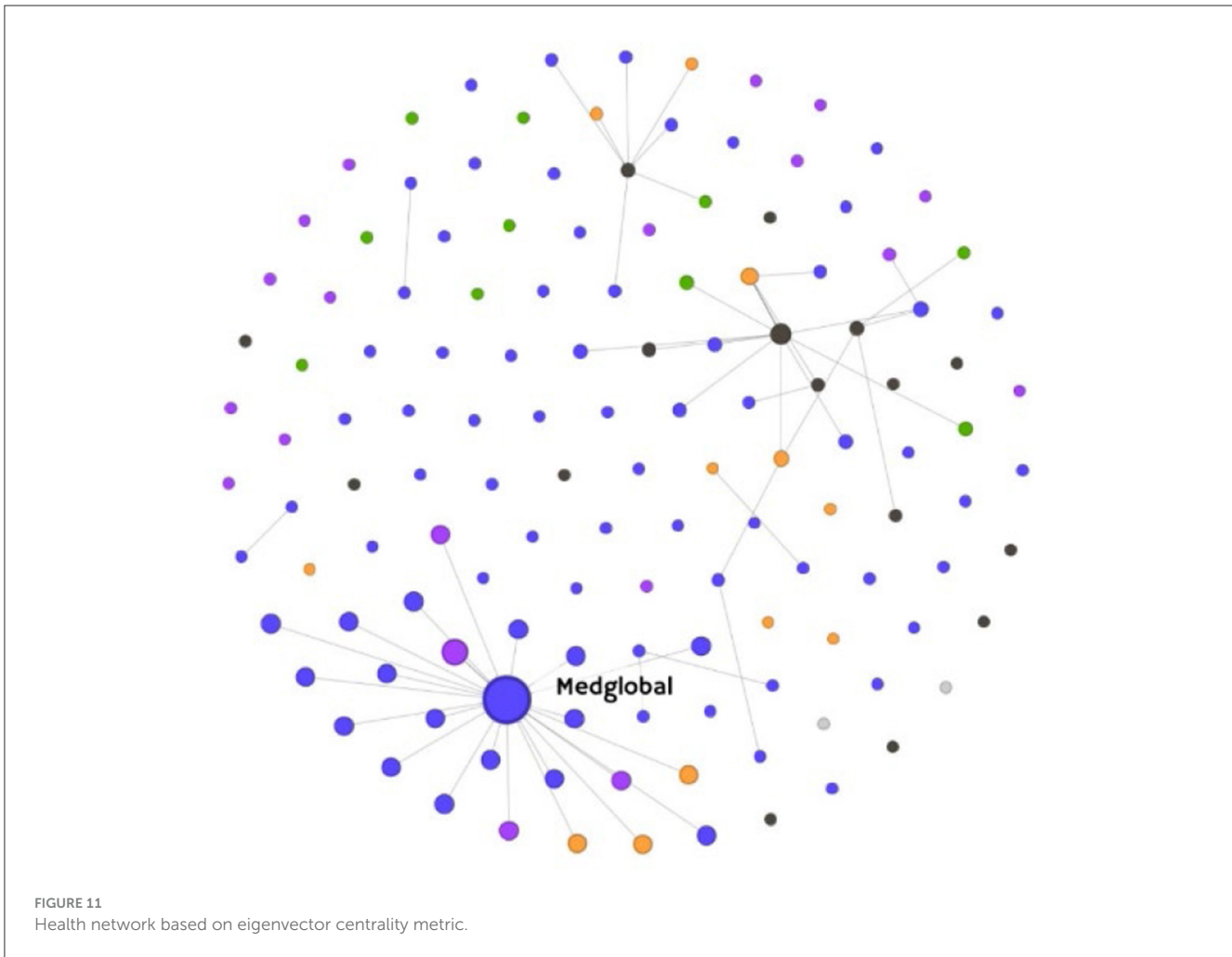


TABLE 13 Top five of the entities with the highest PageRank in Food Security and Nutrition Network.

	Entity	PageRank
1	WFP	0.117
2	Scalabrini international	0.086
3	De Pana Que Sí	0.057
4	UNICEF	0.045
5	Brisas del Norte	0.04

TABLE 14 Top five of the entities with the highest Eigenvector Centrality in Food Security and Nutrition Network.

	Entity	Eigenvector centrality
1	WFP	1
2	UNICEF	0.617
3	ICBF	0.571
4	De Pana Que Sí	0.51
5	Scalabrini international	0.481

crucial role in representing and including migrant voices in the humanitarian aid process, underscoring their vital contribution to Colombia’s humanitarian efforts.

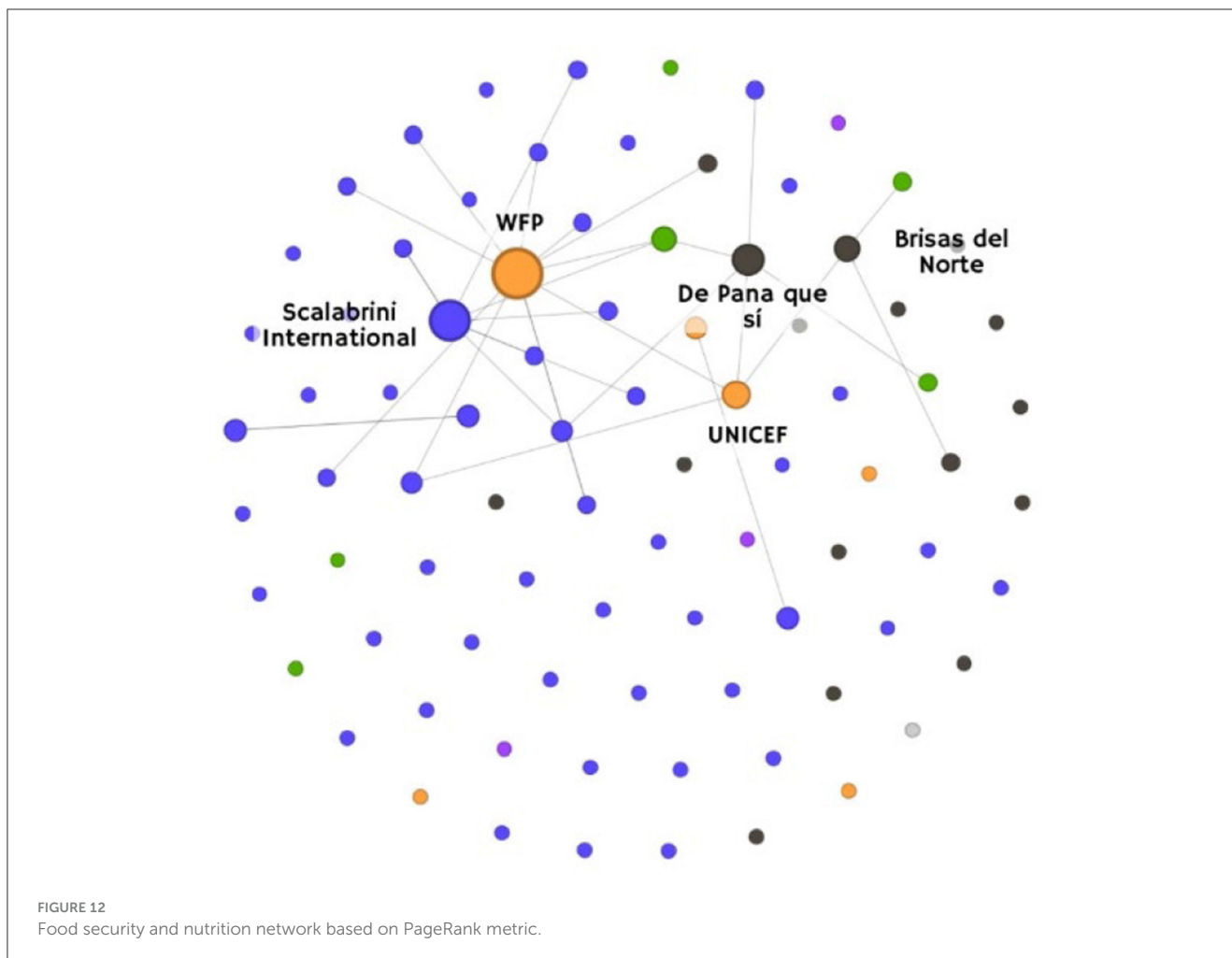
Sub-networks based on humanitarian needs. International NGOs and UN agencies maintain a strong presence and connections in critical areas like protection, integration, food security, and nutrition, underlying their central role in the global humanitarian response.

Additionally, the prominence of organizations linked to the Venezuelan diaspora in multiple sectors reflects the valuable contribution of these communities. Their understanding of the local context and their ability to connect culturally are essential to effectively addressing the needs of affected populations. However,

the limited influence of governmental entities due to scarce connections highlights a coordinated response gap, stressing the need to strengthen governmental capacities.

There is also a clear need to improve coordination among entities working in fundamental sectors such as health and basic infrastructure, where synergies could amplify the efficiency and impact of humanitarian interventions.

Finally, an uneven distribution of resources and attention among sectors is noted, with some areas like humanitarian transportation and water and sanitation management receiving less support, potentially leading to significant inequalities in the vulnerable communities’ wellbeing.



This study on Colombia's humanitarian response to migration significantly contributes to humanitarian aid and migration literature. It uniquely employs a mixed-method approach, combining robust quantitative analysis with qualitative insights. By utilizing Social Network Analysis (SNA) metrics such as PageRank, Density, and Centrality, the research provides a clear understanding of the network's structure, enabling a detailed examination of interactions and collaborations among various actors.

A notable aspect of the study is its emphasis on the diversity of actors in the humanitarian response, aligning with the growing recognition in humanitarian literature of the need for various organizations. The study particularly underscores the importance of government agencies, private sector entities, and diaspora-based organizations in migration contexts.

One of the study's key contributions is its focus on Venezuelan diaspora-based NGOs. This aspect challenges the conventional view in migration literature that often portrays migrants solely as aid recipients. Instead, it presents migrants as active participants in humanitarian responses, offering a new perspective that contrasts with the existing literature's focus primarily on international and local NGOs and government agencies.

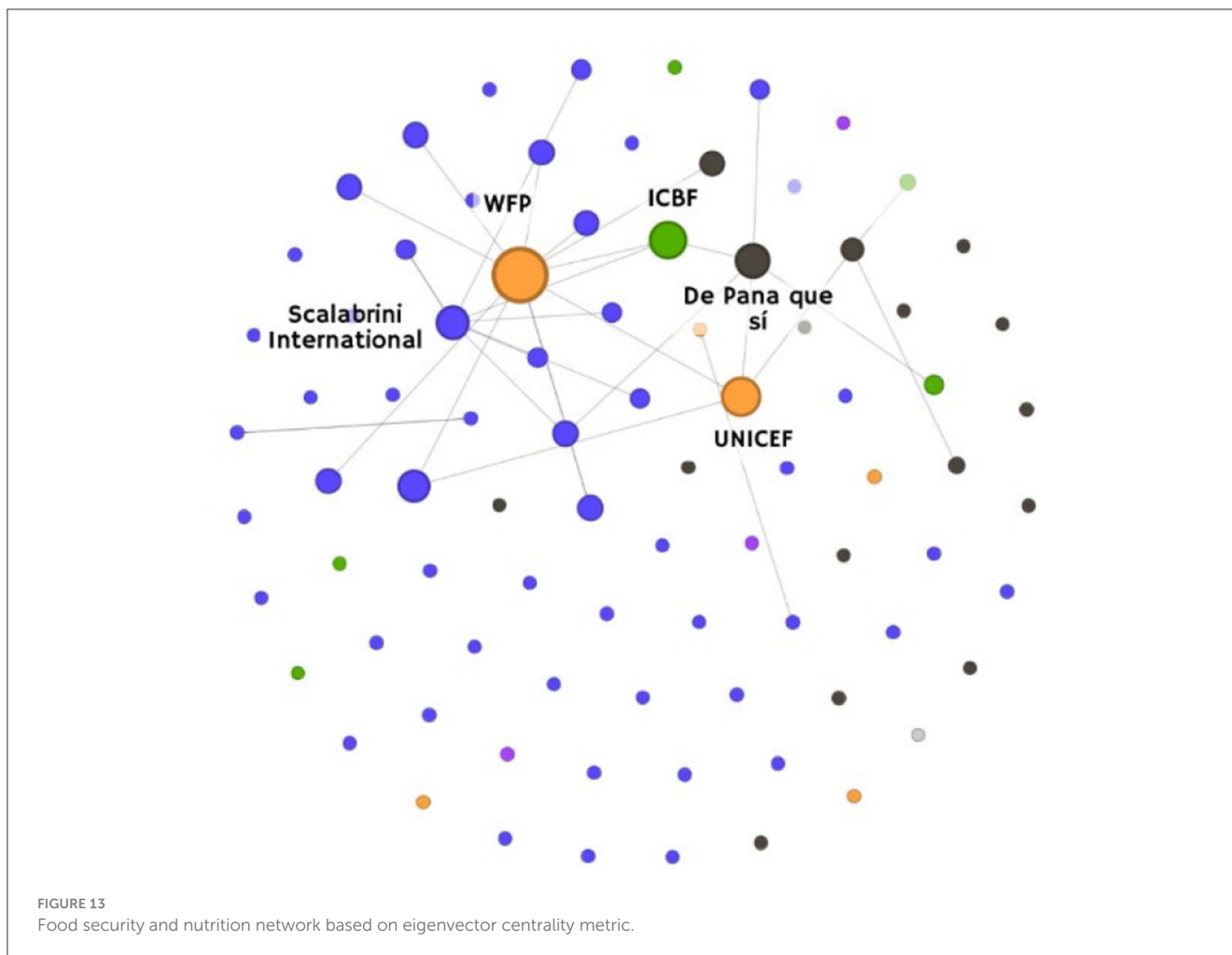
Furthermore, the study explores areas like network connectivity and the role of intermediaries, which are not extensively covered

in the current literature. It provides valuable insights into the interactions and collaborations between entities, enhancing our understanding of network dynamics. This analysis is instrumental in shaping more effective network structures in other humanitarian contexts. The study highlights the importance of intermediaries in facilitating coordination and resource allocation within networks, reinforcing existing research on their crucial role in connecting diverse actors, building capacity, and bridging gaps.

6 Limitations and recommendations for future work

The following recommendations aim to address the current limitations and enhance the depth and accuracy of future studies in humanitarian network analysis in Colombia:

- *Addressing limitations of SNA:* While SNA offers valuable quantitative insights through metrics like Page Rank, density, and centrality, it does not fully capture the qualitative aspects of the humanitarian network dynamics. Future studies should incorporate other methods such as surveys applied to actors, to gain deeper understanding of relationships, informal connections, and context.



- *Exploring alternative metrics:* Future research could benefit from exploring alternative metrics to better understand the network's dynamics. Such an approach might provide a more holistic view of entity interactions within the network and the nature of their connections.
- *Adopting longitudinal approaches:* Given the dynamic nature of humanitarian aid networks and migration, the static snapshot provided by current SNA results is limiting. Future research should employ longitudinal methods to monitor how these networks change over time, offering a more detailed and accurate depiction of network evolution and trends.
- *Focusing on key categories:* The findings highlight the significant role of mechanisms and intermediaries in Colombia's humanitarian aid network. Further studies should explore the dynamics and complexity of their activities to better understand their impact on and contributions to the network.
- *Advanced techniques for relationship evaluation:* For a more detailed and automated evaluation of relationships, advanced techniques such as automated web scraping, neural networks, and Natural Language Processing (NLP) are recommended. Automated web scraping could extract information from websites, providing a more comprehensive view of entity interactions. NLP could analyze documents on entities'

websites to extract relevant data about relationships and collaborations. Additionally, neural network models could be utilized to capture visual information from collaborations images, further enriching the analysis.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study involving interviews was approved by the Old Dominion University Institutional Review Board. This study was conducted in accordance with the local legislation and institutional requirements. The interviews were exempt from requiring written informed consent for participation in this study.

Author contributions

KP: Formal analysis, Writing—original draft, Writing—review & editing. LR: Data curation, Formal analysis,

Methodology, Writing—original draft, Writing—review & editing. EF: Conceptualization, Funding acquisition, Investigation, Methodology, Writing—review & editing. JP: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing—review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fhumd.2024.1345110/full#supplementary-material>

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