

Network effectiveness in healthcare and the impact of the COVID-19 pandemic: connecting the dots

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Abstract

Purpose – Further investigation is needed of network effectiveness in healthcare and how it is influenced by unpredictable events like COVID-19. Based on Provan and Milward's (2001) framework, this study investigates the effectiveness criteria of healthcare networks and their potential contribution to network effectiveness during the pandemic's challenges.

Design/methodology/approach – This research employs an explanatory case study in a local area of Italy's Lombardy Region and analyzes network effectiveness at the network level based on network member perceptions.

Findings – Network effectiveness refers to the network's ability to address patient needs, guaranteeing services through network members' coordinated efforts and a central coordinator that facilitates their interaction. Members' capacity to strengthen their roles played a crucial part in sustaining network effectiveness when COVID-19 revised other members' priorities and threatened achievement of network goals.

Practical implications – This study's findings equip healthcare managers and policymakers with knowledge about network effectiveness criteria at the network level, offering suggestions for managerial practices and network design to address exogenous shocks.

Originality/value – This study identifies factors that influence network effectiveness criteria and provides insight into how network members can contribute to sustaining effectiveness during crises.

Keywords Network effectiveness, Effectiveness criteria, Healthcare organizations, Chronic disease, COVID-19, Italy

Paper type Research paper

1. Introduction

The United Nations (UN) General Assembly adopted its Sustainable Development Goals (SDGs) in 2015 to help guide the world toward peace, prosperity, and sustainability. These goals, particularly SDG 3, which focuses on ensuring healthy lives and promoting well-being for all, have significantly impacted global health. Specifically, SDG 3.4, which addresses prevention and control of noncommunicable diseases (NCDs), also known as chronic diseases, has prompted many countries to develop national strategies aimed at reducing the consequences of healthcare issues that are complex, unpredictable, and pluralistic (WHO, 2021).

Recently, the COVID-19 pandemic severely hindered global progress toward achieving the SDGs agenda (Grossi *et al.*, 2020a). Essential healthcare services have been significantly disrupted in all settings, leading to a shift in priorities within health systems. Consequently, healthcare systems have become overwhelmed and struggle to provide the services they previously extended to communities. Critical healthcare services unrelated to COVID-19 have



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been disrupted or neglected because of this strain, as has NCD prevention, control, and treatment. Unfortunately, this has had long-term consequences, particularly for chronic patients who require regular and ongoing care and are among the most vulnerable (WHO, 2020a).

Collective efforts were required to ensure access to care and treatment sustainability, and the public sector was required to take strong actions to manage healthcare systems. In such settings, the key role of healthcare organizations emerges as addressing people's needs, ensuring their health, and increasing their wellbeing. These are knowledge-intensive public organizations (Grossi *et al.*, 2020b) that offer knowledge-intensive expertise. They operate in knowledge-intensive sectors (Bos-Nehles *et al.*, 2017), which are complex institutional settings characterized by multi-player, multi-level structures with multiple stakeholders who jointly work to provide public services (Grossi *et al.*, 2017).

The recent literature highlights the scarcity of studies centered on healthcare organizations, emphasizing the need to focus on specific areas such as primary care, elderly care, and chronic diseases; it underscores the importance of considering the relationships between private and public providers to sustain the healthcare model (Leoni *et al.*, 2021; Grossi *et al.*, 2020b).

Growing health needs have increased demand for novel organizational structures and roles aimed at knowledge sharing (Mascia *et al.*, 2015) to facilitate and optimize integrated care processes through cooperation among levels, organizations, and sectors (Kokko and Laihonon, 2022). This demand led to the creation of networks, which are "groups of three or more legally autonomous organizations that work together to achieve not only their own goals but also a collective goal" (Provan and Kenis, 2008, p. 231). Networks coordinate joint activities through different types of peer-to-peer relationships (Turrini *et al.*, 2010). This focus on the entire network rather than solely on its individual members addresses the call for discussing network as a whole, rather than treating members as isolated units of analysis (Provan *et al.*, 2007; Provan and Kenis, 2008).

The network literature has primarily focused on examining the dynamics of collaborations between public organizations and non-state actors. However, research that investigates networking practices involving two or more public entities is also needed (Costumato, 2021). These public inter-institutional collaborations entail both formal and informal interactions among formally autonomous institutions that operate at the same or different government levels to achieve policy goals.

Research is also needed that explores whether, how, and under what circumstances such dynamics contribute to the effectiveness of pursuing network goals (Turrini *et al.*, 2010; Whelan, 2015). Network effectiveness, as proposed by Provan and Milward (2001), refers to network capability to effectively deliver needed services to community members. It relies "on the coordinated delivery of an array of different and complementary services by the organizations in the network" (Turrini *et al.*, 2010, p. 530). This coordinated approach might allow the achievement of more positive outcomes than what individual organizations could attain acting independently (Provan and Kenis, 2008).

As Provan and Kenis highlight (2008), a network's outcomes may involve various aspects, such as reinforcing the local capacity to address problems, improving integration of key services, or enhancing responsiveness to unpredictable events, like COVID-19. Research is thus also needed to examine networks' long-term sustainability and their ability to pursue stated goals, especially when faced with contextual shocks.

During the COVID-19 pandemic, healthcare organizations played a critical role in ensuring an immediate response through networking activities to confront the emergency (Jayasinghe *et al.*, 2022). A proactive approach was required from healthcare systems, which involved integrating diverse actors and innovative processes (Georgalakis, 2020). Research has explored the dynamics of interactions among actors when addressing COVID-19 (Fay and Ghadimi, 2020; Wilson *et al.*, 2020). Further investigation, especially qualitative

research approaches, is still recommended to assess the actual ability of collective public actions to confront possible health inequalities generated by COVID-19 (Leoni *et al.*, 2021).

Building on Provan and Milward's (1995, 2001) insights, this study discusses network level effectiveness criteria (Provan and Milward, 2001), including during crises. This research presents an explanatory case study (Yin, 2003) centered on the Chronic Care Model (CCM) and conducted in a local area in Italy's Lombardy Region, which was one of the most affected regions during COVID-19. It investigates network members' perceptions and explores how they acted and interacted to address network effectiveness during the pandemic. Specifically, the following research question is posed:

RQ. How have the effectiveness criteria of public sector networks been able to withstand the test of COVID-19?

The paper is structured as follows. Section 2 summarizes the main relevant literature, focusing on network effectiveness and presenting Provan and Milward's (2001) framework and effectiveness criteria at the network level. Section 3 presents the study design, reports the methodology adopted, and details the CCM's characteristics in the investigation context. Section 4 reports the study results, which are discussed in Section 5. Section 6 draws some conclusions.

2. Literature review

Addressing complex issues in the public sector that require multilateral coordination necessitates more than merely achieving individual organizational goals; it demands collective action and governance (Provan and Kenis, 2008). Extensive research has been dedicated to uncovering the phenomenon of public networks and the factors that contribute to their success (Provan and Milward, 1995, 2001; Provan and Sebastian, 1998; Kenis and Provan, 2009).

Several authors have emphasized the importance of network structural and contextual factors. In their milestone work, Provan and Milward (1995) proposed network centrality and integration as determinants of network success. In particular, they contribute to effectiveness by reducing fragmentation, establishing common norms, improving communication, and limiting opportunistic behavior (Provan and Milward, 1995). Provan and Milward (1995) studied mental health care networks in four US cities and demonstrated that integrating networks around a central agency rather than using a dispersed structure enhances their effectiveness. Expanding on this, Provan and Sebastian (1998) highlighted the significance of network density. They found that even in networks with scattered structures, effectiveness remains achievable by combining the networks with subgroups that jointly share responsibility for network governance. Building on these ideas, Provan and Kenis (2008) and Kenis and Provan (2009) argued that shared governance networks thrive when the partner count is limited and a high level of trust exists among network participants. In contrast, as networks become more complex, the significance of brokered structures, such as a core agency, becomes increasingly pronounced (Huang and Provan, 2007; Raab *et al.*, 2015). However, Provan *et al.* (2007) found that few studies specifically identified the networks' governance models, and that, when it occurred, the networks were mainly in the health and human services sector.

Other scholars have shifted their focus toward network functionality and shed light on the pivotal role of mechanisms that support partner interactions. Network functioning has gained popularity as a determinant of network effectiveness (Turrini *et al.*, 2010), given the critical role of coordination mechanisms that can sustain partner interaction, the influence of different network structure configurations, and varying degrees of formalization (Provan and Kenis, 2008; Cristofoli *et al.*, 2015). For instance, formalized mechanisms, such as information,

coordination, and control mechanisms, have been proposed as facilitators of partner collaboration (Whelan, 2015). Additionally, some researchers have begun exploring less formalized mechanisms, such as identity and trust, and their influence on networks (e.g. Provan and Kenis, 2008; Klijn *et al.*, 2016). The common degree of identification shared by network members and their alignment with the network's objectives are instrumental in enhancing network functionality and generating positive outcomes. Similarly, high trust levels among network participants promote effective network operation and ease network management, contributing to positive impacts (Klijn *et al.*, 2016).

A third group of scholars has emphasized the network manager and leader contributions to network success (e.g. Kort and Klijn, 2011). Network managers can serve as facilitators, mediators, and leaders, and their strategic actions, such as connecting actors, exploring content, structuring interactions, and establishing process rules, can positively affect network success (e.g. Edelenbos *et al.*, 2013).

Recently, a fourth group has explored whether and how structural, functional, and managerial factors can jointly contribute to network success (e.g. Turrini *et al.*, 2010; Cristofoli and Markovic, 2016). In a meta-analysis of empirical public management studies, Turrini *et al.* (2010) introduced two distinct sets of independent network variables: structural and functioning characteristics. Furthermore, they recognized contextual characteristics, considering them both as independent variables and as moderators that influence the relationship between structural and functioning characteristics and network effectiveness.

The literature on this topic has evolved in a piecemeal fashion, resulting in numerous definitions of public networks and network effectiveness. Nevertheless, network effectiveness remains a difficult concept to define (Turrini *et al.*, 2010; Cristofoli and Markovic, 2016; Whelan, 2015).

2.1 Network effectiveness

Among the various definitions of network effectiveness, Provan and Kenis (2008, p. 4) characterized it as "the attainment of positive network-level outcomes that could not normally be achieved by individual organizational participants acting independently." Consequently, focusing on the effectiveness of the network as a whole is preferable to focusing on that of individual organizations (Kenis and Provan, 2009; Provan and Milward, 1995), especially when networks can help integrate critical services into the health and social sector, improve community capacity to respond to natural disasters, meet new community needs in security sectors, and address public problems such as crime (e.g. Cristofoli and Markovic, 2016; Raab *et al.*, 2015; Whelan, 2015). Thus, network effectiveness refers to network participants' collective ability to deliver the services community members need, ensuring sustainability, legitimacy, and maintenance of the network structure itself (Provan and Milward, 2001).

However, no consensus exists on how to measure network effectiveness. Kenis and Provan (2009, p. 441) noted that "scholars who address the issue of network effectiveness do not properly define or operationalize what type of effectiveness (that is, which criteria) they have in mind, focusing instead on different conditions or 'success factors' contributing to effectiveness."

As networks may have members with different beliefs about effectiveness (Provan and Milward, 2001), measuring its effectiveness and choosing one criterion over others is a normative decision (Kenis and Provan, 2009). Furthermore, while there is no scientific way to choose the best criterion for evaluating effectiveness (Kenis and Provan, 2009), some criteria are clearly better than others. For example, a network's success depends on endogenous (e.g. resources and relationships between members) and exogenous (e.g. unpredictable events) factors (Kenis and Provan, 2009). Since only the former might be within the network's control, it is reasonable for effectiveness measurements to be based on those (Kenis and Provan, 2009; Whelan, 2015).

In the academic debate on the criteria for measuring network effectiveness, Provan and Milward (2001) developed a model that has been extensively considered for evaluating public sector inter-organizational network effectiveness (Provan and Milward, 2001). This model focuses on three levels of analysis: community, network, and organization/participant. Each level requires attention, although not necessarily equal, to assess network capabilities to address community needs.

At the *community level*, network effectiveness is gauged by the network's ability to address stakeholders' well-being and needs (Provan and Milward, 1995, 2001). Key stakeholders include service users, funders, politicians, regulators, and the local area's broader community. Thus, network effectiveness relies on meeting stakeholders' diverse expectations and determining which group is the target to be satisfied.

At the *network level*, network effectiveness is tied to structural characteristics, stability, and integration (Provan and Milward, 1995, 2001). These aspects encompass retaining and including members, as well as their interconnectedness and cohesion, particularly concerning services span and completeness. Managing participants and balancing the correct mix of actors to offer a complete inventory of the services stakeholders need emerges as crucial (Provan and Milward, 2001).

The strength of the relationships among network members and across the entire network also plays a significant role. In particular, the concept of multiplexity gains importance when two organizations are connected in multiple ways, thus establishing a stronger link (Provan and Milward, 2001).

At the *organizational level*, Provan and Milward (2001) emphasize the perceived advantages for individual members to participate in networks. While networks can contribute to organizational outcomes (and managers might enter a network aiming to achieve higher efficiency and effectiveness), organizational outcomes become crucial to support overall network effectiveness.

In Provan and Milward's (2001) proposed model, the three levels are interconnected. Network effectiveness evaluations should encompass all three levels, recognizing that one level's outcomes can affect those of another level, and the joint activities of the levels may result in overlaps in stakeholder satisfaction. However, effectiveness at one level does not guarantee effectiveness at other levels. Therefore, each level is important and, although evaluating effectiveness simultaneously at all three levels is desirable, its practicability is burdensome (Raab *et al.*, 2015).

In accordance with the research question, this study's focus is on effectiveness at the network level, considering the network as a whole, evaluating it based on the "network capacity of achieving stated goals" (Turrini *et al.*, 2010, p. 546).

2.2 Effectiveness at the network level

Network mechanisms might rely on informal contacts and personal relationships between people in partner organizations to sustain their interaction (Cristofoli *et al.*, 2015), demanding high commitment levels from participants (Provan and Milward, 1995). Conversely, larger networks frequently require more formalization. In this case, centrally integrated networks offer a network administrative organization (NAO) that acts as an agent in the community and the principal of network participants by monitoring, coordinating, and funding network activities (Provan and Milward, 2001). Reviewing studies on networks as a whole, Provan *et al.* (2007, p. 504) argued that an NAO "is an organization specifically created to oversee the network." An NAO can facilitate, mediate, and lead interactions (Cristofoli *et al.*, 2015). As facilitator, it implements the institutional environment to enhance partners' interactions; as mediator, it addresses tensions and develops negotiation processes. Thus, an NAO supports network effectiveness through trustworthiness, reputation, and influence without exerting hierarchy-driven top-down authority (Provan and Milward, 1995, 2001).

To assess the effectiveness of a network and its NAO, [Provan and Milward \(2001\)](#) suggested some main criteria, the first of which relates to network membership growth. Although the number of participants involved in a network is not limited, and large networks have some advantages, network growth tends to settle down when networks mature. In fact, “after surpassing a certain size, any network will become less effective because of increasing coordination costs, especially in the absence of an NAO” ([Provan and Milward, 2001](#), p. 418).

The second criterion concerns the range of services the network provides that collectively address client needs; the network’s aim is to provide an adequate mix of services. On one hand, the risk exists that a network offers a limited range of services, forcing its clients to look outside to satisfy their needs. On the other hand, when the network involves many organizations, the risk is having an array of services with duplications that confuse clients. Therefore, network level effectiveness can be assessed by “the extent to which services that are actually needed by clients are provided by the network” ([Provan and Milward, 2001](#), p. 418). However, the range of services a network provides depends on its degree of evolution. Newly established networks can be effective if network members provide essential services. As a network matures, its mix of services expands to include those that are critical or peripheral to the network’s characteristics. Thus, in centrally integrated networks, the NAO defines the right mix of services, given its role to fund the network, and authorizes its members to provide some (new) services to clients.

The third way to assess network effectiveness concerns the strength of relationships among members; applying the concept of multiplexity may be useful for this ([Provan and Milward, 2001](#)). When two organizations have multiple ties, they are connected in more than one way. Consequently, the ties are much stronger because the relationship endures even if one tie is broken. As with services, the degree of network maturity is also important for assessing relationships within a network, because when a network is new, its members are not used to sharing information and resources; consequently, ties tend to be weak. As the network evolves, ties among members grow stronger, particularly among those offering complementary services ([Provan and Milward, 2001](#)).

The fourth criterion for assessing network-level effectiveness considers administrative structure. For an NAO, assessing how it fulfils its core agency role, acquiring and then distributing resources for and to the network, is important. When an NAO allocates resources, it aims to enhance the network’s overall effectiveness for the welfare of the community and clients it serves, prioritizing this collective benefit over individual network member needs. The NAO acts as the community’s agent, and its role strengthens the network and the activities its members perform on the community’s behalf. However, resources may be insufficient to guarantee effectiveness at the network level ([Provan and Milward, 1995](#)). [Turrini et al.’s \(2010\)](#) meta-analysis revealed that resources positively impact network effectiveness when other network characteristics, such as integration between members, are working.

3. Study design

3.1 Methodology

The authors conducted an explanatory case study ([Yin, 2003](#)) focusing on the local CCM in Lombardy Region. This method was chosen because its explanatory approach allows analysis of the causes and effects of the observed correlations. Theoretical concepts are also employed to explain the case and possibly extend existing theories to provide a more complete explanation of empirical data ([Taylor and Scapens, 2016](#)).

The CCM model sees the local public Health Protection Agency (Agency) as an intermediary between the Region and local healthcare providers, such as public hospitals or general practitioners (GPs). In this model, specific regulations require GPs to enroll in

associations, which are often non-profit cooperatives, that involve other healthcare professionals (e.g. nurses) as support for GPs managing chronic patients.

This specific context was chosen for the investigation for several reasons. First, the activities and organizations involved in the CCM are complex (Mintzberg, 1983), as they provide specialized care for chronic patients requiring continuous engagement with the healthcare system. Second, the selected local area hosts the largest Italian cooperative that supports GPs managing chronic patients. Third, this area was heavily impacted by COVID-19, which may have potentially affected the model's functioning.

Between April and July 2023, nine semi-structured interviews were conducted with individuals involved in various stages of chronic patient care (Table 1).

Interviews were conducted with five managers involved in the CCM: three in the Agency (Agency_1, Agency_2, Agency_3) and two in public hospitals (Hospital_1, Hospital_2). Other interviews involved a GP, the president of a prominent non-profit cooperative supporting GPs by managing administrative issues for chronic disease management (based in the study area, where 250 GPs are associated with that cooperative), and two presidents of chronic patient associations (Association_1, Association_2) for insights into patient perspectives.

The selection aimed to capture diverse perspectives and gain a comprehensive understanding of the topic (Eisenhardt and Graebner, 2007). Participants were involved based on their willingness to participate in the study, after having been nominated by other respondents.

Face-to-face semi-structured interviews were conducted and recorded. These types of interviews are open-ended, encouraging comprehensive answers and sharing of experiences and emotions (Gudkova, 2018). Their aim is to understand interviewee behavior without imposing any *a priori* categories that could influence the research. Hence, the interview usually begins with descriptive questions, for example, “Which, What, How” questions, as these form the basis for further, more in-depth parts of the interview. The questions can gradually evolve into the form of “Why?” which requires critical reflection on the phenomenon and trust in the researcher (Gudkova, 2018).

Consistently, questions first pertained to the network characteristics and network members' roles and gradually delved into changes the network experienced after the COVID-19 outbreak. The interview protocol was centered around the following themes:

- (1) Interviewee's role in the CCM
- (2) Network structure and responsibilities
- (3) Interactions with other network members
- (4) The role of management information systems (MISs) for patient management, monitoring, and accountability

Health Protection Agency (Agency)	Primary care and family paediatrics management, and convention management unit director (Agency_1) Social Health Department Quality Area Manager (Agency_2) Continuity Care Unit Director (Agency_3)
Public Hospitals	District Director (in one hospital) (Hospital_1) Quality and Risk Management Unit Director (in one hospital) (Hospital_2)
Primary Care Cooperative Associations	General Practitioner (GP) Cooperative President (supporting GPs managing chronic patients) Local Diabetic Patient Association President Local Multiple Sclerosis Patient Association President

Source(s): Authors' own creation

Table 1.
List of interviewees

- (5) Challenges experienced to sustain network's aims
- (6) The COVID-19 pandemic's impact on network activities, management, and responsibilities
- (7) Network members' responses to COVID-19

Interviews ranged from 40 to 75 min, totaling 7 h and 30 min. The data analysis was initiated during the research phase, allowing for overlap between data collection and analysis. This approach facilitated flexibility in the data collection process, embracing a concept known as "controlled opportunism." Within this framework, the researchers capitalized on each case's distinctiveness and the emergence of new themes to enhance the resulting theory (Eisenhardt, 1989). As the research progressed, adjustments were made to incorporate additional themes for deeper understanding of the case. To enhance the validity of the findings, regional regulations were used as supplementary data sources for triangulation (Eisenhardt, 1989).

The qualitative content analysis was conducted following Gioia *et al.*'s (2013) approach. Interview transcripts and regulations were used, with researchers employing iterative rounds of coding. The researchers defined categories, transitioning from data-induced codes to those centered around the research question, existing field research, and literature. This allowed them to connect empirical data with more abstract theoretical considerations.

Themes were structured into sublevels and discussed for consensus, following Vaismoradi *et al.*'s (2013) recommendation. Two researchers led the discussions; a third, uninvolved in the data collection, reviewed the transcripts and themes from an external "outsourcing perspective" (Vaismoradi *et al.*, 2016, p. 106) to ensure critical analysis and maintain objectivity.

The researchers used NVivo 12 software for interview coding (Edhlund and McDougall, 2019). They created a codebook based on categories derived from the theoretical framework, and the text was analyzed line by line and word by word. The identified codes were then applied to relevant sections corresponding to the defined categories (Fereday and Muir-Cochrane, 2006). Table 2 shows a summary of the themes and subthemes used in the analysis.

3.2 The CCM in Lombardy

Given the increase in the epidemiological and economic burden of chronic diseases (WHO, 2020b), the Italian National Health Service (INHS) has required individual regional development of organizational and service models to effectively respond to the evolving demographic and epidemiological scenario.

Addressing chronic conditions has become a priority for the Lombardy Region, which, since 2015, has introduced a series of regulatory interventions to reorganize its health and social-health services. This includes proposing a CCM to ensure personalized healthcare assistance and easier access to care for citizens with chronic conditions (Lombardy Region, 2015a, 2017a, b).

As specified in the normative provision (Lombardy Region, 2015b, p. 59), the network goals involve the following: "The fundamental need is to give concreteness to the widely shared fact that the management of chronic diseases requires continuity in the care process, and that such continuity is achieved through the planning of the path and proactive involvement of patients."

Under the CCM, chronic patients are classified into three levels of decreasing clinical complexity based on co-morbidities and differences in healthcare and socio-healthcare services consumption. Eligible chronic patients who are interested in entering the model are required to choose a professional ("Manager") to take charge of their health needs. The Manager is responsible for care management and organizes all necessary healthcare and socio-healthcare services to meet the patient's needs. The patient's relationship is overseen by

Themes	Second-level themes	Third-level themes
Network membership and growth	Identification of members	Regional framework
	Patterns of member involvement	Public Hospitals Cooperative General practitioners (GPs)
Services provided	COVID-19 times	No integration of additional members Strengthening the Cooperative's role
	Contribution to network aims	Legitimacy as network members Integration of additional services (e.g. Cooperative and GPs)
	COVID-19 times	Reflection on sustaining network aims Limits for patients in accessing facilities Innovation in managing patients
Relationships between network members	Relationships with funding agencies (Region)	Hospitals and the Cooperative Cooperative and GPs
	Relationship with others network members	Relationships among the Agency, Hospitals, and GPs within the local healthcare system
	Multiplexity	Information sharing concerning deficiencies from some members' side Information sharing regarding innovation in managing patients
Administrative structure and NAO	COVID-19 times	Cooperative's access to hospital slots for specialized care Funding mechanisms
	Coordination and integration	Substantial monitoring mechanisms Information systems
	Monitoring processes	Authorization for innovation in managing patients Revision of funding mechanisms from the Region From substantial to more formal monitoring
	Covid-19 times	

Table 2.
Themes for data coding

Source(s): Authors' own creation

a clinician ("Clinical Manager") for clinical aspects and a different healthcare professional for organizational aspects (e.g. a nurse, the "Case Manager").

The Manager can be the patient's GP or pediatrician (for patients with low clinical complexity) or a specialist in a public hospital (for patients of all levels). GPs who act as Managers are required to belong to functional aggregations, usually non-profit cooperatives, which support them in patient management. In this case, the Case Managers belong to cooperatives; otherwise, Case Managers are public hospital personnel.

The Manager and patient sign an annual individual care plan that includes scheduling care services and prescriptions for the year. From there, the Manager guides the patient throughout the care journey, arranging visits, tests, and other necessary treatments based on the care plan. The Case Manager provides support by handling organizational and administrative tasks and scheduling specialized visits and examinations in hospitals. The patient's progress is thus continuously monitored to ensure adherence to prescribed therapies.

Participation in the CCM is voluntary and free of charge for patients; those who choose not to participate in CCM continue to receive assistance from the INHS.

In 2020, COVID-19 heavily affected the Lombardy Region. GPs and health professionals in general faced high exposure to the disease, and access to healthcare facilities for chronic patients was limited (Plagg *et al.*, 2021). This exacerbated the difficulties sustaining the CCM.

4. Results

The results are presented based on Provan and Milward's (2001) network effectiveness criteria at the network level, including network membership and its growth, the range of services provided to fulfil network goals, relationships between network members and their strength, and its administrative structure and coordination. The findings report such criteria considering the network characteristics since its first implementation and then focusing on how these evolved following the COVID-19 outbreak.

4.1 Network effectiveness before COVID-19

After regional regulations were enacted, in 2017, the Agency began implementing the CCM at the local level. Its primary role was coordination:

Our main problem was making the machine work (Agency_2).

In that period, the Agency organized the network based on normative provisions, considering the involvement of few but relevant actors in the local territory. These actors were identified by regulations as those that could collectively provide the full set of services to address chronic patients' needs.

The issue of chronicity is not a recent one. What has evolved recently is a vision centered on the territory and no longer on the hospital. Before CCM, there was a promiscuity of interlocutors who have different roles with respect to the chronicity issue, and there was a need for a strong sharing of the different aspects concerning it (Hospital_1).

A task force of professionals in the Agency responsible for chronic-related matters was established, and the two public hospitals in the local area were engaged. The Agency also invited cooperatives to apply to participate in the CCM, requiring them to present their organization and their relationships with both GPs (to ensure patient involvement) and hospitals (to ensure access to specialized care). Subsequently, the Agency formed a working group that included public hospitals to evaluate candidates and selected five cooperatives to participate in the model.

The model's implementation was not free of challenges. For patient engagement, the Agency sent letters to all chronic patients, inviting them to discuss the possibility of entering the CCM with their GPs. However, as highlighted by the GPs and presidents of both patient associations, the letter was too technical for patients, resulting in limited involvement.

Because most patients had low-complexity conditions, the cooperatives ended up being responsible for the care of 95% of chronic patients, who were involved through their GPs. All interviewees consistently emphasized the importance of engaging GPs.

This aspect was also perceived as critical. According to the GP, initially, they had limited involvement from the Region that did not explain the aims of the CCM, and many of them opposed it. Consequently, only a few initially spontaneously participated in the CCM, but the number gradually increased from 2017 to 2020. The role of the cooperatives, especially those that are well structured and offer multiple services, has been recognized by the Agency as crucial for encouraging GP participation, as a result ensuring wider enrollment of chronic patients. As reported by the cooperative's president:

There was little incentive for the GPs to participate because the CCM required additional work and yielded little economic benefit. We did not actively campaign for their involvement, but we made efforts to simplify their work and make it more manageable (Cooperative President).

Once the network was established, consistent with the stated CCM goals, the continuity of the care process and satisfaction of patients' needs had to be ensured through the completeness of services provided. Interviewees noted the relevance of addressing chronic patients' needs by

making an adequate range of services available, relying on the activities provided by network members, whose number became stable approximately one year after implementation. This was also perceived by professionals as the most important factor from the patient side:

The credibility of the system hinges on our capability to schedule visits, ideally at the hospital preferred by the patients and with the professional who has been attending to them for years. If patients do not receive a satisfactory response due to a lack of available slots, and they are left to book their examinations independently, the effectiveness of the model diminishes in their eyes (GP).

The Agency embraced its coordination role, but also stressed the significance of involving all network members in coordinated service provision based on their specific duties:

Public hospitals kept the complex chronic patients they already had. It was the cooperatives that drove a lot of people, all in the lower complexity range. The mandate for cooperatives was clear: chronic patients were to find the answer to all their care problems from them (Agency_2).

The Agency side considered it key to engage all network members in decision processes by avoiding a top-down approach. This contributed to strengthening the relationships between network members, simultaneously making the Agency role clear:

If you keep up the relationships and you meet people, you hear what the problems are, you make a schedule of activities, you give yourself steps, you do follow-ups, etc., those who are involved must perceive you as useful, otherwise there is no point. In a context like this you can only apply a horizontal method that involves everyone, and not a top-down approach (Agency_2).

Thus, ensuring service provision and bolstering the multiple relationships between network members became the center of Agency activity. Since the network's implementation, several challenges have been addressed, particularly concerning the ability to satisfy patient care needs.

For instance, to ensure specialized visits for patients, cooperatives annually sign supply agreements with hospitals to allocate the slots for specialized visits. However, critical issues arose concerning the availability of slots in facilities within the time frames specified by care plans. Accordingly, in 2019, two years after the network's establishment, the Agency started conducting monthly meetings with cooperatives to closely monitor this matter and coordinated revising the booking process to grant cooperatives preferential access to booking slots in public hospitals. In the Agency aims, this contributed to strengthening the relationship between the cooperative and hospitals while also increasing patient satisfaction with service provision. Further, the Agency revised the hospitals' budgeting objectives, linking a portion of their financing to their ability to increase the availability of slots for cooperatives. The public hospitals acknowledged this issue's significance, and interviewees (i.e. Hospital_2) reported the potential of allowing cooperatives direct access to their agendas.

Network financing and monitoring and MIS structures also fall within the Agency's sphere of influence and its coordinating activity.

The Region provides agency financing based on a fixed tariff determined by the number of chronic patients managed by cooperatives and public hospitals and the number of specialized visits conducted in accordance with care plans. Before COVID-19, this financing system was also linked to monitoring activities the Agency organized across three levels.

The first level focused on assessing care plan adequacy; the Agency implemented a technical commission to discuss it with the cooperatives. Additionally, a formal control mechanism was instigated to track the number of activities per patient, which the Agency monitored and recorded through regional MISs. The second level involved cooperatives and was based on a questionnaire designed to assess their functioning, organization, and responsiveness in addressing patient requests. The third level focused on hospitals and the slots they allocated to the CCM for specialized visits. This allocation was connected to the integrative financing mentioned earlier, which aimed to increase the number of slots available to cooperatives.

However, the public hospitals, cooperatives, and GPs expressed concerns about the monitoring process, citing a lack of proper MISs and fragmented data collection that hindered effective data sharing within the network. This situation threatened the network's achievement of its overall goals:

The data are only available to the Agency. The economic feedback is all borne by the Agency, and we have no MISs to map what is happening. Hence, it is also difficult to share the model's objectives (Hospital_1).

MIS fragmentation has also been observed on the Agency's side, primarily due to the diversity of systems GPs use to manage chronic patients; these are usually provided by the specific cooperative they are associated with. As highlighted by Agency_3, this complexity made it challenging for the Agency to reconcile and integrate information.

Some interviewees, including the cooperative's president, expressed concerns about the emphasis on activity data that do not monitor health outcomes:

There is a great likelihood that this pathway in large numbers will lead to interesting and improving clinical and economic results, but at the moment this is not measured (Cooperative President).

He also reported that they have published reports about their activities' clinical outcomes. However, integration with other actors regarding this matter is lacking. Similarly, one of the public hospitals previously conducted autonomous monitoring of patient satisfaction and published the results online. Unfortunately, these practices were discontinued following the COVID-19 outbreak.

Moreover, interviewees reported that patient relationships were handled only by the cooperatives and public hospitals, which was confirmed by one of the chronic patient association presidents. The Agency never interacted with patients and did not monitor their satisfaction.

4.2 COVID-19 and beyond

The world froze. COVID-19 hit us and hit hard. And neither we, the GPs nor hospitals had the brains to think about chronicity, so that process has slowed down. Some GPs renewed their treatment plans, but at that time, they also had other problems. COVID-19 greatly affected chronic patients, but no one wanted to go to the hospital and the ambulatories were closed (Agency_2).

The COVID-19 outbreak profoundly impacted the CCM's functioning. Regular activities were severely disrupted due to health professionals' urgent focus on addressing the needs of COVID-19 patients. An interviewee described this situation as a "*total system breakdown*" (Agency_1).

The network capability to address chronic patients' needs by sustaining service provision was severely threatened. Specifically, network members were involved to different extents in treating COVID-19 patients, to the detriment of sustaining the CCM. The limited access to health facilities led to a lack of slots for specialized visits in hospitals and problems emerged related to waiting lists. In addition, GPs assumed a front-line role that left limited space for routine activities, such as those related to chronic care.

The Agency was also totally involved in confronting the pandemic:

Throughout 2020, the care of chronic patients was not mentioned in the Agency, it had become an issue in the background [. . .] Cooperatives, on the other hand, were not engaged in different activities and continued their services, also through telemonitoring (Agency_3).

Amid the challenges faced, certain network members took specific actions to sustain the CCM. In particular, cooperatives were the sole members not directly involved in treating COVID-19 patients. Therefore, some of them agreed with the Agency to implement new activities to sustain the model aims and guarantee chronic patient services

The CCM with COVID-19 has been largely suspended. The facilities were no longer responding to us, so the situation was dramatic. We began to think about how to salvage what could be saved. We thought about providing medical devices such as pulse oximeters, blood pressure monitors, and thermometers to chronic patients with COVID-19 and started monitoring them remotely to check all these parameters. At the end, we managed to monitor around 6,000 chronic patients, and 93–94% of them did not need to access the hospital (Cooperative President).

As reported, the cooperative proactively implemented telemonitoring processes for chronic patients with COVID-19, providing them with medical instruments to self-test their health. These self-test results were then discussed by phone or online with the cooperative case managers and recorded on their GPs' MISs. The alert systems the cooperatives implemented in their MISs allowed the GPs to focus solely on urgent issues, streamlining their activities:

They made the system more efficient, because at least someone would bother to contact the patients and see if there were any criticalities, and then alert the GPs. Otherwise, it would have been impossible for us to monitor all patients (GP).

Additionally, patient associations expressed appreciation for this activity, as it positively impacted people's psychological wellbeing and helped prevent patients from feeling unattended. The cooperative's president confirmed this sentiment, reporting that even after the pandemic ended, some patients expressed willingness to continue with telemonitoring.

Likewise, having interacted with the cooperative, when access to healthcare facilities was restricted, one of the public hospitals adopted online instruments to maintain strict contact with their limited number of severe chronic patients. The hospital implemented informal contact mechanisms (e.g. phone calls, chats) and formal telemonitoring services through a dedicated online platform. Patient satisfaction with these measures was evident:

We had less than 100 chronic patients in our care at that time, but they offered to take on their friends or neighbors who had problems and could not find answers elsewhere (Hospital_2).

These initiatives were autonomous but were agreed upon with the Agency and reported to the Region to seek (and obtain) financing support. However, this was an exception, as regulations indicate that telemonitoring can be financed only as a follow-up for specific patient categories.

Nevertheless, the cooperative's innovations in managing chronic patients were and still are recognized by all network members as a way to continue achieving the model's aims. Even after COVID-19, delays related to waiting lists persisted, limiting chronic patients' access to care. Additionally, late diagnoses and missed follow-ups with patients had consequences. These issues were further compounded by a shortage of GPs, as many retired after 2020.

Therefore, telemonitoring activities are becoming increasingly relevant, and several interviewees stressed the importance of revising regulations to expand its applicability (e.g. Agency_2). For example, a public hospital recently initiated a successful experiment involving GPs and specialists in teleconsulting activities to discuss patient situations and enhance GPs' prescriptive appropriateness. Although professionals who are eager to participate have warmly embraced this experiment, it is being conducted without financial recognition from the Region, limiting its scope and implementation.

The COVID-19 outbreak also had impacted the Agency's coordinating activity as it concerns monitoring. Interviewees highlighted a shift toward process monitoring, with limited insights:

Before COVID-19, we could conduct more timely monitoring with a variety of in-depth analyses. Our staff was more abundant and there were no Covid-related issues like swabs, vaccinations, sick doctors, etc. Then there was the collapse, we experienced a shortage of doctors . . . Now monitoring is based on what the MISs say (Agency_1).

Another interviewee stressed that, over time, monitoring has become more formal than substantial:

In recent years, the controls have become more formal: cooperatives were required to send self-certifications, stating that requirements verified earlier remained unchanged. A few spot checks were made, but much softer than at the beginning (Agency_3).

The cooperative's president also confirmed this observation, perceiving a decreased emphasis on their activity from the Agency's side.

Notably, COVID-19 has not led to significant changes in the structure and fragmentation of MISs. However, some recent tendencies of MISs sharing emerged.

As reported by Hospital_1, the Region is currently discussing establishing a digital territory management system. Its primary objective is to centralize all information related to multiple care areas, ensuring interoperability among the existing systems. This could lead to improved patient management and better communication between the various organizations involved in the CCM.

Hospital_2 also reported that this system might address the issue of fragmented monitoring, aiding in performance evaluation. However, the specific features of these systems are still under discussion.

5. Discussion

Network effectiveness plays a crucial role in addressing stakeholder needs and improving integration of key services while ensuring that network goals are achieved, as well as in responding to unpredictable events (Provan and Kenis, 2008).

In the current case, the network is sustained by shared processes that involve multiple actors whose actions are collectively directed toward a shared primary aim, consistent with the regional regulations that established the network. The network is centered in chronic disease management, guaranteeing continuity of care processes through planning care paths and proactive patient involvement. This perception aligns with Provan and Milward's (2001) framework, which considers key criteria identified at the network level to assess its effectiveness. These criteria involve membership growth, the range of services collectively provided to address client needs, the strength of the relationships among network members, the network's administrative structure and the NAO's role. Their relevance differs in the wake of COVID-19, specifically when some network members' involvement in COVID-19 patient treatment was to the detriment of their network contributions, while others took actions toward fulfilling network goals.

Within the regional normative framework, network services are provided through interactions at the local level. Shared decision-making processes are coordinated by those who have formally been given the regional mandate, that is, the Agency, which acts as an NAO, assuming a coordinating role from the organizational and monitoring perspectives (Provan and Milward, 2001). Interviews confirmed that the NAO does not use a hierarchy-driven approach in its coordination activity, aligning with literature recommendations (Cristofoli *et al.*, 2015; Provan and Milward, 1995).

Further, the NAO was not specifically established to suit the networks' aims; its role is attributed to an existing organization that already plays a coordinating role in healthcare services provision at the local level (as from the organization of the INHS), contrary to what emerged in previous literature (Provan *et al.*, 2007; Raab *et al.*, 2015).

Regarding network composition, balance in the number and roles of members participating in the network is seen as key for network effectiveness (Provan and Milward, 2001). Regulations define the types of members to be involved in the network at first, while their responsibilities are specified to guarantee achievement of network aims.

Under this regulated framework, the number of network members has not changed over time; therefore, the actors that were initially appointed remain in charge of providing services. This continued during COVID-19 to the potential detriment of satisfying chronic patients' needs.

All interviewees recognized the network's contribution—providing benefits that would not have been achieved through their separate and uncoordinated actions (Provan and Kenis, 2008)—and that the model's credibility relies on the ability to provide patients with a complete and timely pool of services. However, during the pandemic, services were revised. While previous studies (Provan and Milward, 2001; Turrini *et al.*, 2010) queried the importance of membership growth for achieving network goals, in this case, the contribution to network survival was related to revising members' roles during COVID-19 rather than including additional members. Specifically, all network members shared the importance of satisfying network aims, although during COVID-19, several of them (i.e. the Agency, hospitals, GPs) encountered difficulties sustaining their roles in the model, as they were engaged in confronting the pandemic from the front line. This was also related to the characteristics of the NAO, whose role extended beyond the network, encompassing broader responsibilities in local healthcare management. The NAO was overwhelmed by the urgency to coordinate activities related to treating COVID-19 patients. While this situation could have threatened the network's capability to confront contextual shocks (Provan and Kenis, 2008), some members' initiatives contributed to ensuring network goals were pursued through innovative approaches to patient management, which supported network effectiveness in the face of such an unpredictable event. Therefore, the cooperative, as the one actor that was only marginally involved in COVID-19 patient management, became especially key in defining a proactive and innovative response to patient needs and strengthened its role. Innovative activities introduced through the autonomous initiatives of certain network members, separate from the NAO but in agreement with it, partially helped fill the gap in the model when environmental stability faltered (as recommended by Provan and Kenis, 2008).

The ties between network members and the multiplexity concept (Provan and Milward, 2001) also emerged from the case. For instance, the Agency, hospitals, and GPs are interconnected in providing the multiple healthcare services anticipated by the INHS at the local level, under the Agency's coordination. Furthermore, the relationship between the cooperative and GPs is structured through the various services that the cooperatives provide to the GPs; thus, their relationship is not limited to solely supporting booking slots for chronic patients. In addition, the relationship between the cooperative and public hospitals is established through specific agreements but is also incentivized by the NAO, which coordinates more intensive support to cooperatives from the hospital side in booking processes. As the case illustrates, during COVID-19, the strict relationships among network members allowed the cooperative to obtain information from GP and hospital perspectives to identify the service provision gaps to be addressed to sustain the network's aims. Furthermore, as Provan *et al.* (2007) added, effectiveness is related to network learning. This emerged in particular during COVID-19, as in this case, where innovation in patient management through telemonitoring was first shared by the cooperative and then replicated by one of the hospitals.

Concerning the NAO's role, it benefits from trust and reputation in the network and influences other members (Huang and Provan, 2007), also due to multiplexity. Trust and reputation could guarantee the range and completeness of the services provided and contribute to strengthening members' interconnectedness. This is clearly seen in the role played by the NAO in easing the relationship between the cooperative and public hospitals. This has also been done from a financing perspective, with specific incentives tied to providing cooperatives with slots for chronic patients, in addition to the NAO's established role in guaranteeing regional funding to network members. During COVID-19, the NAO also interacted with the Region to ensure available financing for telemonitoring to sustain

cooperatives' innovation. NAO interviewees highlighted the importance of substantial monitoring processes put in place to ensure that members' activities aligned with normative provisions, consistent with the network's aims. However, some issues emerged concerning centralized monitoring activity and worsened after COVID-19. Member commitment to network goals is somewhat threatened by failure to share information about network outcomes. MIS fragmentation and separation do not support integrating and coordinating services, and network results lack shared external communication processes (Whelan, 2015). Few outcome measures were defined, resulting in limited assessment of patient satisfaction; thus, it is primarily based on providers' perceptions.

6. Conclusions

The study aimed to explore network level effectiveness criteria based on Provan and Milward (2001) and network members' contributions when they include knowledge-intensive public organizations. The research also investigated how network effectiveness was sustained during the COVID-19 pandemic, focusing on network members' different roles.

Specifically, the study discussed network framing in healthcare, with a particular focus on chronic patient management (as recommended by Leoni *et al.*, 2021; Grossi *et al.*, 2020b). The CCM presented responds to the UN's call to ensure a healthy life and promote well-being, as highlighted in SDG 3, particularly in SDG 3.4, which addresses preventing and controlling NCDs.

As indicated by previous research, establishing healthcare networks can potentially facilitate integrated care processes by introducing innovative organizational structures that promote cooperation between organizations (Kokko and Laihonon, 2022; Mascia *et al.*, 2015). This study responds to the call for studies that examine coordination mechanisms in networks, with a specific focus on inter-institutional collaborations (Costumato, 2021). To achieve this objective, the study adopted a qualitative approach, allowing an in-depth investigation of such interactions and narrowed the investigation to the consequence of the COVID-19 pandemic (Leoni *et al.*, 2021).

The study provides theoretical implications for the debate on network effectiveness by adopting Provan and Milward's (2001) framework, which focuses on the network level criteria that can support it. The insights derived from this study are centered around the factors that contribute to achieving stated public goals and network effectiveness in a knowledge-intensive setting. The research explores interactions among knowledge-intensive public organizations and other actors, such as cooperatives, which, although they are not institutional players in the INHS, have an institutionalized role in the model. The research discussed the characteristics of network effectiveness before COVID-19 and specifically contributed by exploring how these changed during the pandemic.

The results also integrate Provan and Milward's (2001) framework by specifically emphasizing that when exogenous shocks occur, the need to revise the balance between network members in providing services could be addressed by strengthening specific members' roles rather than adding members to compensate for other members' deficiencies and guarantee that network goals were achieved. In this specific case, during COVID-19, while the Agency, public hospitals, and GPs' activities were legitimized by their engagement in confronting the pandemic, cooperatives were the sole organizations fully devoted to supporting chronic patients. Their legitimization was sustained by the innovations they proposed in patient management (i.e. telemonitoring), which also played a key role in their financial sustenance during a period when other revenue sources for cooperatives were limited due to a halt in patient enrollment. The NAO contributed to coordinating a different mix for providing services and to supporting such autonomous initiatives that would fit this goal. It also attempted to merge such innovation within the Regional normative framework, trying to ensure financial support for the cooperative to establish permanent telemonitoring.

Therefore, this study explores how the network demonstrated responsiveness to COVID-19 (Provan and Kenis, 2008) through some of its members' proactive efforts. These members contributed to sustaining network effectiveness, albeit with certain limitations, while other network participants faced challenges. Consequently, the study provides valuable insights into the role of networks during emergencies, particularly during the COVID-19 pandemic (Jayasinghe *et al.*, 2022). Furthermore, the case examines networks' capability to address the health inequalities that emerged during the pandemic (Leoni *et al.*, 2021) by analyzing the collective action, which involved multiple public actors, especially knowledge-intensive public organizations (Costumato, 2021). The focus on the healthcare context is advantageous, given its knowledge-intensive characteristics and frontline involvement in the COVID-19 emergency.

From a practical standpoint, the study provides valuable insights for managers and policymakers, shedding light on the challenges faced by healthcare networks in addressing standard care activities during COVID-19. Healthcare managers can benefit from insights into the most relevant factors for achieving network goals and valuable approaches for addressing inter-institutional relationships, especially in emergency situations. This knowledge can help managers make informed decisions and improve network operational effectiveness.

For policymakers, the study offers insights into network framing and the challenges institutions face, such as outdated financing policies that may not align with innovation in healthcare activities. By understanding these challenges, policymakers can work toward creating more effective and up-to-date policies that support healthcare networks. Moreover, it highlights the criticalities that may hinder achieving network goals, particularly during unpredictable events. These insights can be valuable when designing prospective network models, helping policymakers consider potential challenges and develop strategies to effectively address them.

The study opens discussion for future research adopting Provan and Milward's (2001) framework and exploring network effectiveness criteria in the healthcare context, with a particular focus on the COVID-19 pandemic's impacts on inter-institutional dynamics and healthcare organizations' ability to contribute to the SDG agenda.

Future research can contribute to this topic by employing different methodological approaches. Furthermore, this investigation could be extended to different settings and involve various actors, including those in emerging countries or contexts where healthcare systems are not publicly financed.

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