Social network analysis in primary health care: an integrative review

Análise de redes sociais na atenção primária em saúde: revisão integrativa

Análisis de redes sociales en la atención primaria de salud: revisión integrativa

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Abstract

Objective: Social networks are considered as the relationships that connect people, groups or institutions and influence the access to health services. Social Network Analysis is a quantitative method, used in social relationship studies in different areas, including health. It has recently been incorporated in Collective Health and Nursing. The objective was to know how the social network analysis method has been applied in studies undertaken in Primary Health Care.

Methods: The integrative literature review method was used, including the following phases: definition of search criterion, selection of articles and analysis according to the defined temporal and geographical distribution categories, selected types of networks and actors and main outcomes. The thematic categories after the analysis were: Social Network Analysis as an analysis strategy of the professional network, and Social Network Analysis as an analysis strategy of users' social network.

Results: The results indicate that the publications tend to concentrate in the past five years and that the method is more used in English-speaking countries. All studies used other methodological approaches together with Social Network Analysis. In the professional networks, the interinstitutional and interpersonal relationships stand out, reaffirming the ordering role of primary health care in the care network. With users, the social network analysis highlighted the relevance of the primary networks and support organizations.

Conclusion: In conclusion, the social network analysis can evidence relational structures and flows in Primary Health Care, which are of interest for collective health and nursing studies.

Resumo

Objetivo: Redes sociais são entendidas como as relações que conectam pessoas, grupos ou instituições, e exercem influência no acesso aos serviços de saúde. A análise de redes sociais é um método quantitativo, usado em estudos sobre relações sociais de diversas áreas, incluindo a saúde, sendo de incorporação recente pela Saúde Coletiva e Enfermagem. O objetivo foi o de conhecer como vem sendo aplicada a metodologia de análise de redes sociais em estudos que têm como cenário a Atenção Primária à Saúde.

Métodos: A metodologia foi a de revisão interativa de literatura, e cumpridas as suas etapas de definição de critério de busca, seleção de artigos e análise segundo as categorias definidas de distribuição temporal e geográfica, tipos de redes e atores selecionados e principais resultados. As categorias temáticas após a análise foram: A análise de redes sociais como estratégia de análise da rede de profissionais, e a análise de redes sociais como estratégia de análise da rede social de usuários.

Resultados: Os resultados indicam que as publicações tendem a se concentrar nos últimos cinco anos, e a metodologia é mais utilizada em países de língua inglesa. Todos os estudos usaram outras abordagens metodológicas juntamente com a análise de redes sociais. Nas redes de profissionais, destacam-se as relações interinstitucionais e interpessoais, reafirmando a atenção primária à saúde como ordenadora da rede de cuidados. Com usuários, a análise de redes sociais destacou a relevância das redes primárias e das organizações de apoio.

Conclusão: Conclui-se que a análise de redes sociais possui potencialidade para evidenciar estruturas e fluxos relacionais na Atenção Primária à Saúde, com interesse para estudos em saúde coletiva e enfermagem.

Resumen

Objetivo: Se entiende por redes sociales a las relaciones que conectan personas, grupos o instituciones, y ejercen influencia en el acceso a servicios de salud. El análisis de redes sociales es un método cuantitativo, utilizado en estudios sobre relaciones sociales de diversas áreas, incluyendo la salud, habiéndose incorporado recientemente a la Salud Colectiva y a la Enfermería. Se objetivó conocer cómo se aplica la metodología de análisis de redes sociales en estudios cuyo ámbito es la Atención Primaria de Salud.

Métodos: Se realizó revisión interactiva de literatura, y se cumplieron sus dos etapas de definición de criterios de búsqueda, selección de artículos y análisis según las características definidas de distribución temporal y geográfica, tipos de redes y actores seleccionados y principales resultados. Las categorías temáticas luego del análisis fueron: El análisis de redes sociales como estrategia de análisis de la red de profesionales, y El análisis de redes sociales como estrategia de la red social de usuarios.

Resultados: Indican que las publicaciones tienden a concentrarse en los últimos cinco años, y que la metodología es más utilizada en países de habla inglesa. Todos los estudios aplicaron otros abordajes metodológicos conjuntamente con el análisis de redes sociales. En redes de profesionales se destacaron las relaciones interinstitucionales e interpersonales, reafirmando la atención primaria de salud como ordenadora de la red de cuidados. Con usuarios, el análisis de redes sociales destacó la relevancia de las redes primarias y las organizaciones de apoyo.

Conclusión: El análisis de redes sociales tiene potencial para evidenciar estructuras y flujos relacionales en Atención Primaria de Salud, siendo de interés para estudios en salud colectiva y de enfermería.

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Introduction

Social networks are considered as the relationships that connect and link different people, groups or institutions, with greater or lesser cohesion, interactivity, sustainability, duration, among other attributes. In the social sciences, the individuals who belong to this system are recognized as social subjects or actors. The articulation among subjects through the digital social media, such as Facebook or Twitter, have also been widely called social networks, which lies beyond the object of this study.[1]

The networks are of some influence in the access to health services. What the social support networks are concerned, mainly the primary networks (referring to the closest relationship circle), these influence the use and choice of services, professional or practices and can act to motivate the individual or not to turn to the health services and express their demands, besides granting material and emotional support and providing information on service functioning.[2]

A distinction is due between the qualitative study that depart from the social network concept (such as research on the social support networks), in which the use of the term can be metaphorical, and Social Network Analysis (SNA) as a structured method, which is the focus of this study.[3]

SNA is a quantitative method that primarily aims to map and study the relationships and positions of actors in the networks, considering them as relationship structures. It is accepted that structural SNA establishes analysis levels concerning the relations among individual actors and their positions and interactions in the network as a whole, permitting comparisons with other similar networks. SNA-based studies gained momentum in the 1970's, although they started many decades before that.[4]

An important classification in SNA refers to the starting point for network mapping. It can depart from an individual (ego or egocentric networks), successively interviewing, in a snowball process, the other actors or knots the initial actor interacts with. The size of the network is decided on in function of the study objectives and resources. They can in-clude all links within a certain institution, place or territory (total or integral networks), or also map the interactions among individual subjects together with institutions/sectors, in this case called two-way networks.[4]

The development of SNA was mediated by the interest in discovering the relations among actors through inferential statistics among the variables, based on mathematical modeling for analyses that can be more or less detailed, besides the graphical display of networks, which has been important because it grants a rapid and objective view of the relationship structures. Computer software has been used as important support in SNA, the most used programs being UCINET ©, Pajek ©, GEPHI ©, Egonet©.[5]

These computer programs come with graphic representation extensions that permit picturing the network image in the form of a sociogram, as well as statistical modeling. This modeling is not necessarily the main core of analysis. UCINET ©, like other software, offers resources for descriptive and visual methods that permit verifying network cohesion and density, and produces analyses of each actor's centrality and intermediation, among other descriptive categories. The mathematical base of the method, however, does not exclude the possibility of articulating its use with qualitative approaches, such as studies developed in Information Science and, more recently, in nursing.[1,6-9]

In health, studies can be found that are based on the social network concept, as well as studies based on SNA, departing from different frameworks – medical and social anthropology, sociology, organizational studies, among others. In Brazilian Collective Health and Nursing, its incorporation is recent.[1-3]

In view of the need to expand the knowledge on the research methods that permit the analysis of social practices from a perspective that considers the complexity of the health-disease-care phenomena, SNA is a method that can cooperate to express the relationships, exchanges, reciprocities, interests and the importance of the social actors in the institutional and non-institutional health care contexts, including Primary Health Care (PHC). It is also of

interest to nursing due to the nurse's important mediating role at this care level.[1-8]

The objective in this review was to know how the Social Network Analysis has been applied in studies inserted in or related to actors who Interact in Primary Health Care, whether users, health professional or sectors/services.

Methods

This is an integrative review of the literature, which permits synthesizing the knowledge on a given subject by unifying the results obtained in other studies or diverse research.

Considering the six phases or steps for its construction, in the first, the guiding question of the research was elaborated, on how SNA has been used in studies based on PHC.[10-11]

The second stage consisted in structuring the literature search, through a survey of the scientific publications in the Virtual Health Library (VHL), comprising scientific articles available in the following databases: Latin American and Caribbean Literature in Health Sciences (LILACS),

Online Medical Research and Analysis System (MEDLINE), Specialized bibliographical database in Nursing (BDENF) and Scientific Electronic Library Online (SciELO).

For the search of the articles, the key terms "social network analysis" and "primary health care" were used. As inclusion criteria, we considered: original articles, deriving from field research using SNA; full text available in the databases, in Portuguese, English and Spanish, and published between 2005 and 2016. Initially, the publications were selected by reading the titles, followed by the reading of the abstracts and later the full texts.

Initially, 20 scientific productions were found, only 15 (fifteen) of which considered the inclusion criteria, as can be observed in the search flow diagram shown in figure 1.

Three publications were excluded because they did not address issues pertinent to the research object, mainly because they are not applicable in the PHC scenario, restricting their discussions to theoretical rather than empirical perspectives.

In the third phase, a data collection instrument was used to register the relevant information on the selected studies, which permitted surveying the fol-
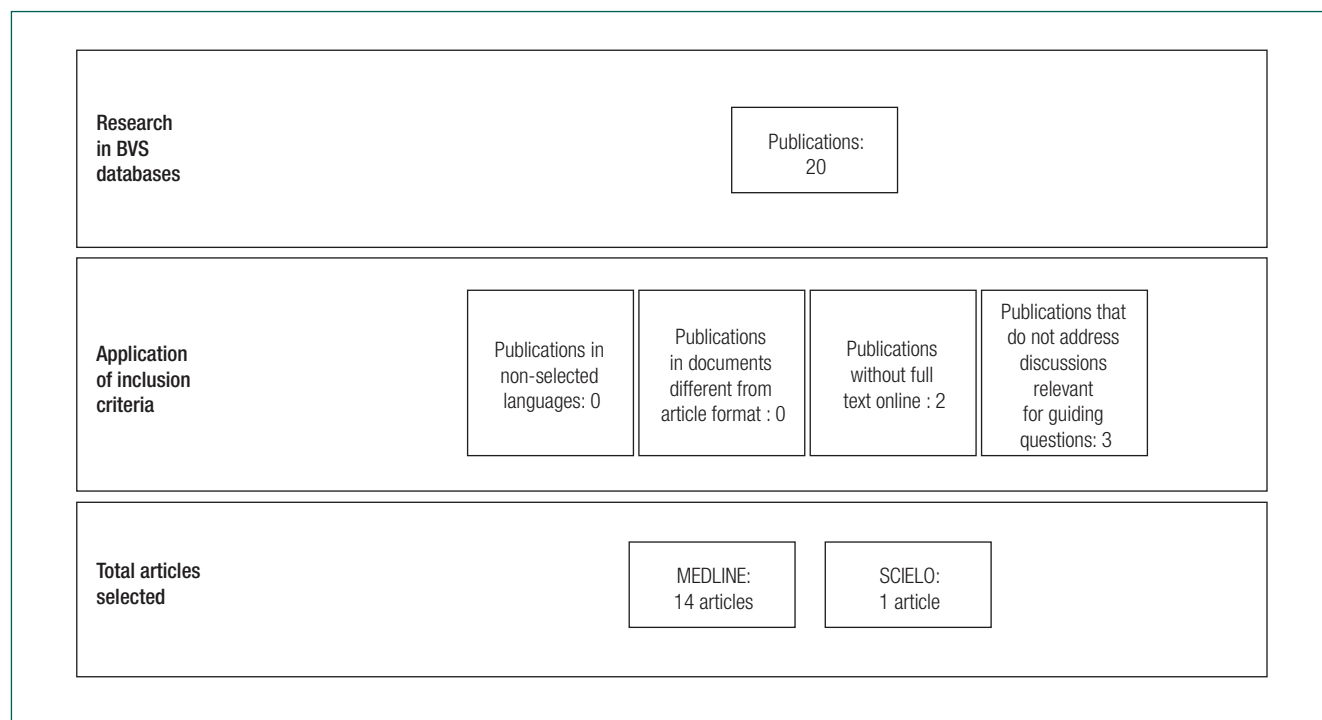

Figure 1. Study selection flowchart for the integrative review

lowing categories for analysis: title of the articles and name of the authors, year, country and language of publication, objective(s), type of network analyzed and actors involved, and main outcomes.

In the next phase, the collected data were analyzed based on the identification, convergences and divergences related to the following characteristics of the studies, which permitted the identification of two thematic categories entitled "SNA as an analysis strategy for PHC professionals' network" and "SNA as an analysis strategy of users' social network", with a view to permitting the discussion of the results based on the interpretation and comparison with the theoretical framework.[10]

Results and Discussion

Chart 1 summarizes the main elements in the articles selected for the development of this study, followed by a brief descriptive characterization of the selected publications.

About the publication period, the years 2013 and 2015 stood out because they concentrated half of the sample studied. As for the countries of publication, the majority is English-speaking: the United States and Canada (n = 10), followed by Australia (n = 2), Pakistan and Brazil (with 1 article each). A larger volume of studies conducted in North America was already expected, as SNA software has been developed and widely used in the United States of America.[5]

SNA is hardly used as a method in the health sector in Brazil, as expressed in the only publication in the country. In a simple search in academic databases, areas such as administration, sociology and economics have published studies using SNA in Brazil. Publications on the use of SNA in Brazil seem to focus on some authors in the field of Information Science.[6,7] This field has gained an important role in the diffusion and use of the SNA method, as well as to bring SNA closer to the other fields of knowledge, including the field of health.

All articles used SNA as a method, combined or not with other approaches, mostly qualitative, and 86% indicated UCINET© as the program of choice for data analysis.

In SNA, both individuals and institutions can be considered as actors.[4,5] In this sense, it was observed that the great majority of the publications used SNA as a method to interpret existing social relationships among health professionals working in PHC, with emphasis on doctors and nurses. Of the four articles that explored network relationships involving users or communities, only two mapped these networks, through individual interviews and egocentric SNA. Two others analyzed integral networks.

The range of objectives in the use of SNA in PHC is highlighted, aiming to evidence interactions and the influence of the relations among users and between users and teams, and within the teams, to support the care and management processes, thus producing two main categories, according to the subjects analyzed in the networks - professionals or users.

SNA as a strategy to analyze the network of PHC professionals

The network measure, among the articles analyzed, was used to calculate density and centralization variables in the context of the interaction in the multiprofessional primary care team;[25] to describe the network of discussions involving women's health in primary care and to examine the factors that determine the physicians' position in that network;[12] and to analyze the same network of professionals, mediated by managers, in different periods, concluding that despite the changes in the structure and composition, the central role of management actors was maintained, which granted the actors a certain independence from management in relation to the care network.[13]

Networking of professional interactions was applied as a way to qualify the management of elderly care teams in South Australia.[14-26] The network was analyzed as a management device, which helps to evidence tensions, conflicts and critical knots.

The relations established in the PHC work processes highlight the role of nurses as a central actor in health service organization, in social network articulation and concerning their influence in decision making, despite not necessarily being the

Chart 1. Synthesis of data collection

Title, authors, language, year and country	Objectives and network types	Results
Social network analysis as an analytic tool for interaction patterns in primary care practices (Scott j et. al). English. 2005, USA.[12]	Describe how SNA can be used to characterize and compare communication patterns in professional practices in PHC. Two total networks.	The use of SNA to investigate social networks in PHC offers potentials and limits. SNA is considered a good tool to study complex systems represented by practices within PHC.
Factors affecting influential discussions among physicians: a social network analysis of a primary care practice (Keating N et al). English, 2007, USA.[13]	Assess the network of influential discussions among PHC physicians working in a teaching hospital on the theme woman's health. One total network.	Informal interactions among colleagues that influence decisions are frequent. Related factors are: clinical experience with women; convenience in time and space; colleagues of the same sex.
Partnerships in primary care in Australia: network structure, dynamics and sustainability. (Lewis JM, Baeza JI, Alexander D.) English, 2008, Australia.[14]	Analyze the network structure with two governance partnerships in Primary Health Care in Australia, within a time interval. Two two-way networks.	Central government affects local network coordination; an independent coordination group is relevant to maintain connected networks. Long-term partnerships tend to maintain more stable networks.
Mutual understanding in multi-disciplinary primary health care teams. (Quinlan E, Robertson S.) English, 2010, Canada.[15]	Analyze relationships of communication and understanding in shared decision making in PHC teams according to professional categories. Egocentric networks with nurses.	In the 4 teams, the decisions involved other professional than nurses and physicians; factors like team cohesion on PHC objectives affect mutual decision capacity; interaction flow in the network increases with mutual communication and vice-versa.
Social networks and physician adoption of electronic health records: insights from an empirical study. (Zheng K et al). English, 2010, USA.[16]	Study how social interactions influence physicians' adoption of an electronic chart system. Egocentric networks with physicians, according to questions on different interactions (professional, personal and influence).	The professional network shows interactions between residents and other physicians, the personal networks express more interactions between physicians in the same category (residents), with some actors showing higher degree centrality, and the influence network to decide on using the charts was significantly smaller and dispersed, evidencing that few colleagues influence the decision.
Variation in patient-sharing networks of physicians across the United States.(Landon BE et al) English. 2010, USA.[17]	Identify professional networks among physicians, based on shared patients, examining how these networks vary across geographic regions and determine factors associated with interactions among physicians. Egocentric networks using health system records based on the patient.	Important geographical variations were found in the identified networks, but the study is inconclusive on their factors. There is a trend towards some shared identity among physicians in the same network. Complex factors seem to relate to the formation of physician networks.
Primary health care teams and the patient perspective: a social network analysis. (Cheong LHM et al) English, 2013, Australia.[18]	Describe the health networks of PHC patients, comparing different care groups, gain an understanding about the nature and extent of their interactions and identify pharmacists' role in the patient networks. Egocentric networks with asthma patients.	The patient networks were classified under community groups, clinical groups and mixed networks, without mutual interaction. The interaction with pharmacists in the network was considered minimal.
Knowledge flow and exchange in interdisciplinary primary health care teams (PHCTs): an exploratory study.(Shannon L et al). English, 2013, Canada.[19]	Explore how clinical research knowledge flows through multidisciplinary PHC teams and influences the clinical decisions. Total networks with six PHC teams.	Obtaining research knowledge was seen as a shared responsibility among the team members, while its application in patient care was considered the responsibility of the team leader, generally the senior physician. The team members recognized the need for information access, synthesis, interpretation or management resources.
Brokering for the primary healthcare needs of recent immigrant families in Atlantic, Canada. (Isaacs S at al). English, 2013, Canada.[20]	Analyze how organizations that act as brokers supported a network of PHC services to respond to the needs of recent immigrant families with small children. Total network with organizations.	The institutions that act as brokers/negotiators are fundamental for the migrants to access the service network. The main institutions were: migration central, child legal support sector and public health sector.
Competence trust among providers as fundamental to a culturally competent primary healthcare system for immigrant families.(Isaacs S et al). English, 2013, Canada.[21]	Explore how an organization's trust in the cultural competence of other service providers (competence trust) can influence the efficacy of a service network to attend to the needs of recent immigrant families. Integral network with 27 organizations	Nongovernmental organizations were identified among the most culturally competent. Systemic cultural competence building in a service network is necessary to improve collaborations and service access for immigrant families.
The communicative power of nurse practitioners in multidisciplinary primary healthcare teams. (Quinlan E, Robertson S). English, 2013, Canada. [22]	Explore the role of nursing practitioners in facilitating knowledge exchange in multidisciplinary PHC teams. Egocentric networks with nurses.	The conclusions of the study refer to the knowledge exchange behavior structure and particularly to the role of the NP as a knowledge boundary spanner.
Advancing the application of systems thinking in health: advice seeking behavior among primary health care physicians in Pakistan.(Asmat U et al), English, 2014, Pakistan.[23]	This study analyzes the extent to which the existing PHC system in Pakistan facilitates physicians' access to information sharing, focusing on cases of measles and tuberculosis. Egocentric networks with physicians.	The PHC physicians developed their own strategies to overcome communication restrictions. The search for council and information depended on the existence of informal social interaction with senior specialists.
Fortalezas, Oportunidades, Fraquezas e Ameaças (Matriz FOFA) de uma Comunidade Ribeirinha Sul-Amazônica na perspectiva da Análise de Redes Sociais: aportes para a Atenção Básica à Saúde. Gomide et al. Portuguese, 2015, Brazil.[24]	Understand information transmission processes in a community on the banks of the Madeira river (CRSA) to support the Basic Health Care strategies. Egocentric networks with leaderships.	The results were articulated with the categories proposed by the SWOT matrix (strengths, weaknesses, opportunities, threats). The categories evidenced strong and weak aspects in the network, particularly the leader's role.
Effects of primary care team social networks on quality of care and costs for patients with cardiovascular disease (Marlon P et al). English, 2015, USA.[25]	Assess the associations among communication, interaction and coordination of the PHC team using SNA, associating care quality and costs for cardiovascular patients. Integral networks with six PHC teams.	Teams with dense interactions among all team members were associated with less days of hospitalization and lower costs. Teams with interactions around some core individuals were associated with more days of hospitalization.
Testing a model of facilitated reflection on network feedback: a mixed method study on integration of rural mental healthcare services for older people. (Fuller J. et al). English, 2015, Australia.[26]	Test a network reflection management model as a means to engage the services in problem solving on primary mental health care for elderly people. Organizational integral management and service network.	For the sake of effective facilitation of group reflection and exchanges in the network, a network management needs to be neutral, not obstructive, and with credibility in health and social services, with leadership to build confidence through facilitation and mediation.

institutional leader of the team.[15] In addition, the pertinent role of nurses at two specific moments is observed, being: management and performance in health teams.[17,18]

One of the studies concerns the role of nurses within PHC health teams in a Canadian province, from a network perspective, highlighting their mediating role between actors and knowledge.[22] The use of the term "knowledge boundary spanner" connotes the idea of an actor or device capable of expanding or mediating, in an expansive way, knowledge and relationships within institutions and outwardly, with the ability to cross or break limits.[15,27,28] It suggests an approximation to the concept of "weak link", specific to SNA studies, to identify the actor in the network that occupies the outermost position with regard to the possibility of expansion and communication with other subjects and networks. It can be considered that the adjective "weak" does not express the effective role of this link in the networks, as these are precisely the links that permit the expansion and renewal of a network. Recent studies based on SNA developed in Brazil have presented results similar to the role of the nurse and the community health agent (CHA), and the nurse has emerged as an important mediator for network cohesion, and the CHA for its expansion.[1,8,9]

Particularities were also observed with regard to social networks composed of PHC physicians. With regard to the construction of networks for the exchange of professional information and knowledge, it was noticed that medical professionals tend to seek peers of the same sex for the construction of their networks. In addition, the subjects' social and geographical proximity was identified as a determinant in the therapeutic choice and decision-making process.[12,16,23]

Relationships among team members influence the problem-solving ability of health practices.[12] It was observed that, the higher the density of the relationships between the members of the PHC teams, the lesser the number of days of hospitalization of the users they attend.[25]

These findings point to the importance of interprofessional relationships, within the same category and with others, as well as to the relevance of PHC to order and serve as a gateway to the care network, as the way in which networks are configured and how actors perform their activities in these networks can affect other care levels.

SNA as an analysis strategy of users' social network

The social networks of users in the articles analyzed highlight the participation of PHC professionals, family members and non-health organizations.[18]

One of the articles uses SNA to map the networks of individuals with asthma, based on which other networks were mapped, which included health professionals from various treatment categories, family and friends, as well as other sources of resources such as educational materials and internet access. The study was developed in Sydney, Australia. Although the work in PHC predicts the provision of multiprofessional and multidisciplinary care, it has been observed that users tend to establish denser connections with relatives and friends, who often lack health knowledge.[18]

Another study carried out in Australia, but in a territory in the South, aimed to use SNA as a management device, capable of inducing reflections in the organizations involved in care for the elderly, regarding their role and that of the other institutional actors in the care network for this group.[19] The article criticizes the fact that there are groups of actors acting in an integrated way, in a network, but that the total group of institutions does not have sufficient interaction. On the other hand, the reflection provoked by the return and discussion of the data enhanced the actors' understanding about the network performance.

In a study developed in Canada, the interest was to study the networks of governmental and non-governmental organizations that support immigrant communities, assuming that the capacity to generate perceived trust is a cultural competence that affects the quality of relations between organizations and immigrant families.[20] A list of 31 organizations involved with immigrants was provided to each of these organizations, asking them to respond concerning the relationships established with each, and to assess their cultural competence

towards the immigrants' needs. This study aimed to evaluate the organizational network, mapping the total network and interviewing key informants of each. The conclusions indicate that the greater or lesser cultural competence of an organization is capable of affecting network relationships, enhancing or making it difficult for immigrant families to access their needs.[21]

The only Brazilian article identified refers to a study involving community leaders from the riverside region in the South of the Amazon region. The primary care level is considered as a background for the analysis, as the study is focused on a perspective that aims to map the interactions and exchanges of information in these communities. The analysis proposes categorizations that consider the theoretical sociological contribution of Michel Grossetti about the network relations and autonomy of the subjects, and discusses the role of leadership and its centrality in the networks of groups with specific sociodemographic characteristics, such as riverine communities.[24] Implications for PHC, based on the Brazilian Basic Care proposal, are discussed against the background of the theory of social determination of health, and the historicity of social processes, which has brought about changes in structures and forms of relationship in traditional communities.

Conclusion

The set of publications originates in several studies that converge to the analysis of the relational forms among actors, institutions and/or organizations, with a view to access and quality of care in PHC. Studies that were based on mixed methods have brought interesting contributions about how relationships and interactions occur, collaborating to broaden the knowledge about historical, cultural, political and organizational determinations about network configurations and dynamics. For the area of Collective Health, considering the concept that health is not restricted to the absence of illness, the studies based on SNA are presented as a methodological possibility that can evidence interpersonal and institutional relational structures, and their influences on health-disease-care processes. It should be kept in mind that the studies based on SNA have an important limit, which refers to the size of the network studied, as not all interactions at stake can be included; as well as the cross-sectional cut. It is also argued that a theoretical and conceptual framework is needed to give greater density to the analysis of network structures and interactions, considering that the method is not explanatory by itself. For nursing, as a professional category whose performance is relevant in the context of PHC, SNA can be a methodology for studying teamwork processes and user care, in a relational perspective. In this sense, it can be an element capable of contributing to the effectiveness of the interdisciplinary and mediating vocation of the profession, with a view to greater equity and universal access to health actions.

Acknowledgements

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