A CONTRIBUTION TO THE ANALYSIS OF THE FIRST SPANISH PUBLIC-PRIVATE PARTNERSHIP IN PRIMARY AND SPECIALIZED MATERNITY CARE: A SOCIAL NETWORK ANALYSIS APPROACH

ANÁLISIS DE LA PRIMERA COLABORACIÓN PÚBLICO-PRIVADA EN ASISTENCIA MATERNAL EN ATENCIÓN PRIMARIA Y ESPECIALIZADA EN ESPAÑA: UNA APLICACIÓN DEL ANÁLISIS DE REDES SOCIALES

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Abstract

The La Ribera University Hospital (Alzira, Valencia) was the first experience of public-private partnership in the Spanish National Health System. In addition to the need to coordinate two levels of health care (primary/specialised), two models of human resource management (public/private) had to be coordinated. To illustrate this complexity, the group of midwives in the health area has been taken, analysing their relational patterns through the methodological approach of Social Network Analysis. In terms of results, out of a population of 31 midwives, those of the public model occupy peripheral positions and cooperate poorly, both internally and externally. However, those of the private model constitute a cohesive subgroup, which proves to be both a strength and a weakness. Midwives in primary care and in the private model bridge subgroups. Therefore, the presence of two management models determines the efficiency of maternal care rather than the division of care into two levels.

Resumen

El Hospital Universitario de La Ribera (Alzira, Valencia) fue la primera experiencia de colaboración público-privada en el Sistema Nacional de Salud español. Además de la necesidad de coordinar dos niveles de atención sanitaria (primaria/especializada) hubo que coordinar dos modelos de gestión de recursos humanos (público/privado). Para ejemplificar esta complejidad, se toma el colectivo de matronas del área de salud, analizando sus pautas relacionales mediante la aproximación metodológica del Análisis de Redes Sociales. En cuanto a resultados, de una población de 31 matronas, las del modelo público ocupan posiciones periféricas y cooperan poco, tanto interna como externamente. Las del modelo privado constituyen un subgrupo cohesivo, que supone tanto una fortaleza como una debilidad. Las matronas de Atención Primaria y modelo privado constituyen puentes entre subgrupos. Por tanto, la presencia de dos modelos de gestión condiciona la eficiencia de la atención maternal más que la división de la atención en dos niveles.

Keywords

Healthcare coordination; healthcare levels; care management models; midwives.

Palabras clave

Coordinación sanitaria; niveles de atención sanitaria; modelos de gestión; matronas.

INTRODUCTION

At the end of the 1990s, the Spanish National Health System (NHS) opened up to other new care management schemes (Government of Spain, Law 15/1997 on new forms of NHS management). The objective of these privatisation strategies was to improve health management, and consequently its efficiency, by the introduction of market elements into the public system (Sánchez-Martínez, Abellán-Perpiñán and Oliva-Moreno 2014). These initiatives include formal or direct privatisation (such as foundations and clinical institutes) and functional privatisation or indirect management, which involves different schemes, such as integrated health organisations in the region of Catalonia (Vázquez et al. 2005) and public-private collaborations in another regions of Spain, such as that of Valencia and Madrid (Sánchez-Martínez, Abellán-Perpiñán and Oliva-Moreno 2014).

Public-private collaborations include public-private partnerships (PPP) and private finance initiatives (PFI). The objective of a PFI is to provide non-healthcare services, while in a PPP the private sector is in charge of both designing and creating health infrastructures and managing clinical services (López-Casanovas and Llano-Señarís 2017; Sánchez-Martínez, Abellán-Perpiñán and Oliva-Moreno 2014; Barlow, Roehrich and Wright 2013). Therefore, a PPP is defined as "a long-term contract between a private party and a government agency, for providing a public asset or service, in which the private party bears significant risk and management responsibility" (Roehrich, Lewis and George 2014). They are present in different countries of the European Union, for example we have the "internal market" in Great Britain and Sweden, and they have been the object of different evaluations in countries such as Portugal, Italy, Germany, Sweden, Canada and Australia (López-Casanovas and Llano-Señarís 2017; Barlow, Roehrich and Wright 2013; Sekhri, Feachem and Ni 2011; Herr, Schmitz and Augurzky 2011; Cappellaro and Longo 2011). The spread of such management schemes is not a phenomenon exclusive to Spain nor to the health sector. There are examples of PPPs schemes in urban development projects in Netherlands, for example the Utrecht Centre Project, the Amsterdam South Axis and the Central Station project in The Hague (Klijn and Teisman 2003). Education, general and social services, economic and cultural activities, or housing, among others, are also matters in which PPP and PFI are present in local governments of several European Union countries (Torres and Pina 2001).

In Spain, the first PPP in the health sector came into being in 1999 when the La Ribera University Hospital (HULR, in Spanish) was built in Alzira (Valencia, Spain), which since then has become known as the "Alzira Model" (Rechel et al. 2009). This model progressively spread to other health areas in the region of Valencia (covering 20% of the population in the region), and in other regions of Spain (practically all the newly built hospitals in Madrid) (Caballer-Tarazona and Vivas-Consuelo 2016; Barlow, Roehrich and Wright 2013; Rechel et al. 2009). In these cases, PPPs were promoted by conservative-type regional governments. Similarly, in Portugal the conservative government embarked on an ambitious PPP programme that was curtailed when a socialist government came into power (Sekhri, Feachem and Ni 2011). This proliferation took place despite the fact that, to date, barely any independent evaluations exist (López-Casanovas and Llano-Señarís 2017; Sánchez-Martínez, Abellán-Perpiñán and Oliva-Moreno 2014). Thus, the HULR, the flagship of the PPPs in Spain, acted as a true experimentation laboratory and became, in parallel, a national and international reference point (Barlow, Roehrich and Wright 2012).

During the first years, the Alzira Model was in charge of only hospital management (Specialised Healthcare, SH). However, in 2003 Primary Healthcare (PH) was included, which went on to manage all the healthcare services in the health area (SH plus PH) (Rechel et al. 2009; Tarazona, de Rosa and Marín 2005). At that time, all PH staff members belonged to the public healthcare model, which depended on the regional government. PH staff members had the option of continuing in the public model or moving to the private one. Approximately 20% moved to the private model, which led to a co-existence between both human resources management models in PH centres. Thus, the staff who continued in the public health model did so under different working conditions from those of the private one. This factor could have implied difficulties for health coordination, as well as explaining the need expressed by the Alzira Model to include such coordination within its strategic objectives. The objective which stands out amongst these is aimed at making sure that users do not perceive healthcare as having different stages; due to this, coordination between healthcare levels would become the system's main axis (Tarazona, de Rosa and Marín 2005).

Healthcare coordination could be defined as an agreement reached among all the healthcare-related services, regardless of the place where they are received, and in such a way that they are synchronised and meet a common conflict-free objective (Terraza, Vargas and Vázquez 2006). In turn, there is said to be continuity of care when referring to the outcome of healthcare coordination from a user's perspective (Haggerty et al. 2003). On the other hand, Rodríguez and des Rivières-Pigeon (2007) defined continuity of care as "consistent care existing across time with an emphasis on the patient as a unique individual". Ever since the General Health Law was passed (Government of Spain, Law 14/1986, General Health Law), proper coordination between SH and PH has been one of the main challenges for health services. Ac-

cording to Henao, Vázquez and Vargas (2009) the historical separation between care levels (PH *versus* SH) is a key factor behind the complexity of healthcare coordination, and has contributed to the emergence of values which go against collaboration and teamwork. Nevertheless, it remains unsatisfactorily solved due to the lack of this precise coordination, meaning that users perceive a fractioned image of the system, which leads to problems of accessibility and can render the provision of these services less efficient (Ortún and López 2000).

In this sense, it is worth remembering that the concept of efficiency used in this work refers to the provision of goods or services using the combination of lower cost inputs (Vázquez et al. 2005). The difficulties of coordinating healthcare systems, the different perspectives (of both professionals and users) and the various healthcare levels are not exclusive of Spain and are also found in other health systems (Waibel et al. 2016; Perdok et al. 2016; Schölmerich et al. 2014; Robinson 2010).

When organising healthcare in Spain, maternity healthcare is considered a particularly vulnerable healthcare process as it is provided from both healthcare levels. Consequently, continuity and fluid cooperation between both levels is necessary as an essential condition for suitable care provided to both the mother and the newborn (Martínez and Baena 2004). It has been shown in the literature that focusing on continuity of care and provider collaboration increases efficiency of care (Kroll-Desrosiers et al. 2016; Schmied et al. 2010). The intention of the Alzira Model was to reinforce this continuity between different healthcare levels via "integrated committees in the health area", where one specific committee was to deal with the maternity care process (Tarazona, de Rosa and Marín 2005). In Spain, midwives are in charge of caring for pregnant women with low-risk pregnancies from both healthcare levels; that is PH (controlling and following up pregnancy) and SH (healthcare during the birth process). They are also in charge of detecting risk situations and, if necessary, of referring pregnant women to high-risk consultations with obstetricians. Therefore, a good communication-coordination system is absolutely necessary. Nonetheless, healthcare coordination in the maternity care sector has not been studied, at least not systemically (Schölmerich et al. 2014).

The group of midwives working in a health area can be considered as a group of network professionals that need to be interconnected to provide proper health care. So, it would be most interesting to analyse to what extent this network of health professionals is organised and works efficiently when providing services to the maternity care process. The network structure of health professionals can be studied through the methodological Social Networks Analysis (SNA) approach.

It provides knowledge about the structural properties of social networks of a group of actors, and information about their degree of cohesion (Knoke and Yang 2008; Wasserman and Faust 1994). Cunningham et al. (2012) stress that cohesive professional healthcare networks enable effective healthcare coordination. At the same time, several studies point out that working in well-coordinated health professional networks is associated with improved quality of care, increased patient satisfaction, improved efficiency and decreased care costs (Groenen et al. 2017; Kroll-Desrosiers et al. 2016; Waibel et al. 2016; Schölmerich et al. 2014; Den Breejen et al. 2014; Tahan and Campagna 2010). Therefore, it can be understood that a measure of the cohesion of a group of health professionals through the SNA approach is a useful proxy to analyse the efficiency of that group.

SNA has had a considerable development in the social sciences domain (Borgatti et al. 2009). Nevertheless, in the health sciences there has been a very quick development in recent decades (Shelton et al. 2019; Vassliev, Marques-Sánchez and Serrano-Fuentes 2019; Perkins, Subramanian and Christakis 2015). Some well-known analysis refer to, for example, relational guidelines in the transmission of infectious diseases (Smith and Christakis 2008), relationships in health organisations (De Brún and McAuliffe 2018; Provan, Harvey and Guernsey de Zapien 2005; West et al. 1999) and public health (Ramos-Vidal 2019). In spite of the growing number of SNA and health studies in recent years, there are few studies carried out using the SNA methodology that refer to maternity care (Groenen et al. 2017) and to date there are no contributions specifically linking the analysis of maternity care and health PPPs from the SNA approach.

Consequently, this research contains several aspects that can be used as a starting point: firstly, two human resources management models (public and private) co-existing in the maternity care process in the La Ribera health area; secondly, healthcare is provided to this process from two healthcare levels (PH and SH) which, to ensure the efficiency of the provided service, require close coordination among professionals (midwives); thirdly, the group of midwives makes up a social network whose efficiency depends mainly on its network structure, and on other relational characteristics, such as that of cohesion. Finally, according to the literature (Balkundi and Kilduff 2006; Hanneman and Riddle 2005; Wasserman and Faust 1994), a useful proxy to analyse the efficiency of this kind of social networks is based on the methodological SNA approach.

The main research hypothesis is that the co-existence of two human resources management models (private *versus* public) in the La Ribera health area can determine the efficiency of the services provided by midwives to a greater extent than belonging to a given healthcare level (SH *versus* PH). This happens despite

the division in the two healthcare levels (PH/SH) having been traditionally the main obstacle for suitable coordination and cooperation among health professionals.

As a result, the study objectives are:

1. To define the degree of the midwives' social network cohesion in the La Ribera health area.

2. To analyse its network patterns, particularly its centrality positions and brokerage capacity, and its relation with certain attributes (such as belonging to a management model and a healthcare level).

3. To detect its collaboration patterns according to the main attributes.

Data and methods

The study universe includes all the midwives who are active professionally in the La Ribera health area: 31 midwives in total (15 in PH and 16 in SH). Data collection took place between June and December 2016 at the HULR and in 12 primary healthcare centres in the same area. The selected network questionnaire was used in a previous research (Esparcia 2017) and it was adapted to collect socio-demographic and relational data from midwives. It was piloted with the first 5 midwives, and no modifications were required. All the midwives received a questionnaire about their occupational networks via which socio-demographic data were collected: age, gender, place of residence, the management model for which they work, the healthcare level they professionally work at, years of work in the area and the number of years in their current position.

As regards social networks, the questionnaire firstly asked about the people with whom they came into contact in occupational terms (from a list of actors). They were next asked about type of contact (directly, telephone or new technologies) and frequency (weekly, up to 3 months, and up to 1 year). Although frequencies can be seen according to contact type, the SNA is restricted to the network of direct contacts as this is the most relevant one for the study objectives. As it is a closed and defined network, the socio-centric approach was applied (e.g., the network of actors forms a squared matrix, with those who generate the relations in rows and those who receive them in columns).

Data were processed by an Excel spreadsheet for the basic statistical analysis (mean, standard deviation and range for the quantitative variables, and frequency and percentage for the qualitative variables), the Ucinet (Borgatti, Everett and Freeman 2002) and Netdraw software (Borgatti 2002) for SNA. A brief description of the indicators used is provided in Table 1.

The study was approved by the Ethics Committee-Research Committee of the HULR in February 2016. Written authorisation was requested from all the midwives, including informed consent to complete the questionnaire. They were informed that their personal data would be coded and not diffused for any purposes other than the research project. Responses were coded by taking into account the attributes of the midwives who answered; that is, whether they belong to the public model (C) or the private one (U), whether they belong to PH (P) or SH (E). As interviews were conducted by personnel unrelated to the authors, they worked only with anonymous data.

Table 1
Summary of the relevant network and node measures.

Measure	Description
Density	Proportion of links present in a network in relation to the largest number of possible links. The higher the density, the greater the cohesion and relational efficiency (information diffuses more quickly). The network can be subdivided into segments, and the internal/external density of each one can be calculated.
Reciprocity	In a directed network, they are mutual relationships between each pair of actors which imply recognition, acceptance and mutual trust. This facilitates the information flow. By being associated with horizontal relationships (weak ranking), they can be the basis for cooperation and shared leadership processes.
Centrality	Degree centrality: the proportion of nodes to which an actor can be connected directly (adjacent). The in-degree (proportion of adjacent nodes from which relationships are received) can be distinguished from the out-degree (proportion of adjacent nodes to which relationships are "sent"). The former is an indicator of prestige, and the latter is an indicator of social activity and the capacity of accessing resources. Betweenness centrality: the frequency with which an actor is placed on the geodesic path (the shortest) between each pair of nodes. Greater betweenness capacity indicates being in better control of optimum communication flows.
Brokerage	Brokerage capacity between different groups of actors or segments of a social network. If a network has three groups or segments and three actors (A, B and C), and B is the actor that acts as a broker or bridge, there are five possible functions: Coordinator (A, B and C are in the same group: B acts as an internal coordinator); Consultant (A and C belong to a different group to B, who acts as an external coordinator); Gatekeeper (A belongs to a group, and B and C belong to another, different group: B channels the flows of relationships towards its own group); Representative (A and B belong to a group, and C to another: B channels the flows of relationships from its own group); Liaison (A, B, C belong to different groups: from the outside, B channels external relationships among the different groups). As relationships among groups tend to be different and complex, the actors B with a good brokerage capacity occupy more influential positions in the social network.

Measure	Description
Factions	The cohesive groups that result from the relational characteristics of the actors in the social network. Each group is defined by high internal cohesion and by marked separation from other groups. Each actor forms part of a single cohesive group. Different tests allow the optimum solution to be approached in the number of groups (the correct final proportion comes closer to 1).
Cliques	Groups with at least three interconnected actors (adjacent). This indicates social cohesion in integration terms; i.e., locally dense groups (unlike factions, here any actor can be present in different groups).
E-I Index	With two social network groups/segments or more (divided according to attributive characteristics), it is the relationship between the proportion of each group's internal and external links. It measures each group's degree of openness or endogamy at the heart of the social network (varies between -1, endogamy or complete homophily and +1, openness or complete heterophily).

Source: Borgatti, Everett and Johnson 2013; Hanneman and Riddle 2005; Wasserman and Faust 1994; Gould and Fernandez 1989).

RESULTS

Out of the population of midwives who worked professionally in the La Ribera health area (N=31), three decided not to participate in the study (they belonged to PH and the public management model). Thus, 28 midwives participated, i.e. 90.3% of the study population. The main socio-demographic characteristics are shown in Table 2.

Table 2
The study sample's socio-demographic characteristics.

Quantitative variables	Mean	SD	Range
Age	44.5	8.2	27-62
Years of professional work	16.3	8.5	3-32
Years in current job position	11	5.5	1.5-18
Qualitative variables	**Attributes**	**%**	**Frequency**
Gender	Female	96.5	27
	Male	3.5	1
Place of residence	Inside the area	42.8	12
	Outside the area	57.2	16
Healthcare level	PH	42.8	12
	SH	57.2	16
Management model	Public	14.3	4
	Private	85.7	24

a. Frequency and type of contact

In the occupational relationships network, the highest frequency of relationships (n=495) occurs via direct contact (Table 3). Frequency is higher in the private model and in SH (weekly in more than half the cases). However, more contacts via other means

Table 3
Frequency and type of occupational contact between midwives.

Type of contact	Groups (*)	Total contacts	Contacts per actor	Weekly (%)	Up to 3 months (%)	Up to 1 year (%)
Direct (n=495)	UE (n=16)	302	18.8	55.6	21.5	22.9
	UP (n=8)	143	17.8	11.9	60.8	27.3
	CP (n=4)	50	12.5	4.0	58.0	38.0
Telephone (n=72)	UE (n=16)	25	1.6	24	60	16
	UP (n=8)	35	4.3	68.5	22.9	8.6
	CP (n=4)	12	3	8.3	58.4	33.3
New technologies (n=235)	UE (n=16)	164	10.2	31.1	55.5	13.4
	UP (n=8)	61	7.6	68.8	27.9	3.3
	CP (n=4)	10	2.5	0	100	0

(*): U: private model; C: public model; E: SH; P: PH

(telephone and new technologies) stand out in the private model, specifically in PH. One reason for this could be that the PH midwives' territorial dispersion is broader as they work in different primary health centres, as opposed to all the SH midwives concentrated at the HULR. Nonetheless, the fact that territorial dispersion is wider or narrower does not seem to justify the comparatively low frequency of the PH midwives in the public model compared to the private model ones. Hence, some tendencies may be associated with the typical dynamics of one model or the other.

b.   The network's density

The overall density (level of cohesion) of the occupational contact network is high (0.71), but increases when the network divides according to different attributes (Table 4). Depending on the healthcare level, it becomes much higher for the SH midwives (0.99) than for the PH ones (0.74). Depending on the management model, internal density is only slightly higher in the private model (0.82) than it is in the public one (0.75). When analysing the relationships or cohesion among the different groups, the results show a certain separation in the dynamics of one model or the other, with less interest shown by the private model in maintaining stable relationships with the public model midwives (0.34), while the latter show more interest in the private model midwives (0.55). In any case, an obvious separation appears, along with certain greater "self-sufficiency" in the private model, which should not prevent greater integration and better linkage between both groups. This separation becomes less significant (and not so serious) when comparing the relationships from SH to PH, and *vice versa* (0.53 and 0.65, respectively), although there is plenty of space for such improvements in the relationships between groups.

Table 4
The network's density according to healthcare level and management model.

Healthcare level density			Management model density		
	SH	**PH**		**Private**	**Public**
SH	0.99	0.53	Private	0.82	0.34
PH	0.65	0.74	Public	0.55	0.75

c.   Reciprocity

The obtained results (Table 5) indicate high reciprocity (76 %), which is an ideal context for important information flows and cooperation mechanisms at the core of the social network. However, some significant differences appear between actors and groups, which falls in line with the results obtained in other indicators. Accordingly, a first group, formed mainly of the actors from the private model and in SH, has a very high proportion of relationships of this kind (UE14,

UE10, UE16, UP2, UE5, UE9 and UE2), above 90% in all cases. Conversely, the actors from the private model, but from PH, present a lower proportion of reciprocal relationships and are, therefore, more limited in terms of cooperation and work in the network (UP1 and UP8, with % below or equal to 50%). Another important point is that all the actors from the public model obtain medium-low values (less than 70%) in a network with a generally high reciprocity.

d.   Centrality measures

In the occupational contact network (Table 5), two of the actors linked to the private management model obtain positions of maximum centrality in the three indicators used (UE14 and UP2). These two actors are characterised by their position as middle managers within the group of midwives. Thus, UE14 is the head of the SH group, and UP2 is the secretary of the PH group. The actors linked to the public model always occupy the last positions (CP2, CP3, CP5 and CP8). A second group of actors linked to PH stands out in the private model, particularly for its high betweenness capacity (UP3, UP4, UP5 and UP6) (Figure 1).

Table 5
*Centrality measures by actors for the occupational contact network and reciprocity (normalised data).*

Actor (*)	Reciprocity	Out-degree	In-degree	Betweenness
UE1	0.83	0.81	0.85	1.36
UE2	0.90	0.74	0.78	0.25
UE3	0.82	0.70	0.81	0.26
UE4	0.87	0.81	0.81	0.64
UE5	0.91	0.81	0.78	0.51
UE6	0.74	0.70	0.81	0.37
UE7	0.62	0.52	0.78	0.02
UE8	0.86	0.70	0.78	0.14
UE9	0.91	0.78	0.81	0.62
UE10	0.96	0.85	0.85	1.35
UE11	0.78	0.78	0.78	0.43
UE12	0.71	0.56	0.81	0.16
UE13	0.84	0.81	0.89	1.81
UE14	0.96	0.96	0.93	3.31
UE15	0.81	0.63	0.81	0.23
UE16	0.95	0.78	0.78	0.40
UP1	0.41	0.44	0.81	0.86
UP2	0.93	1.00	0.93	3.59
UP3	0.78	1.00	0.78	2.77
UP4	0.81	1.00	0.81	2.95
UP5	0.70	1.00	0.70	2.54
UP6	0.67	0.96	0.70	2.48
UP7	0.82	0.33	0.41	0.20
UP8	0.50	0.33	0.56	0.29
CP2	0.61	0.33	0.44	0.19

Actor (*)	Reciprocity	Out-degree	In-degree	Betweenness
CP3	0.65	0.56	0.48	0.66
CP5	0.69	0.41	0.33	0.95
CP8	0.58	0.41	0.30	0.14
Network's mean	0.76	0.67	0.70	0.57

Actor (*)	Reciprocity	Out-degree	In-degree	Betweenness
Network's SD	0.14	0.22	0.18	1.10
Mean UE	0.84	0.74	0.82	0.42
Mean UP	0.68	0.68	0.69	1.32
Mean CP	0.63	0.42	0.38	0.36

(*): U: private model; C: public model; E: SH; P: PH

Figure 1

The occupational contact network. Midwives from the La Ribera health area in Valencia.
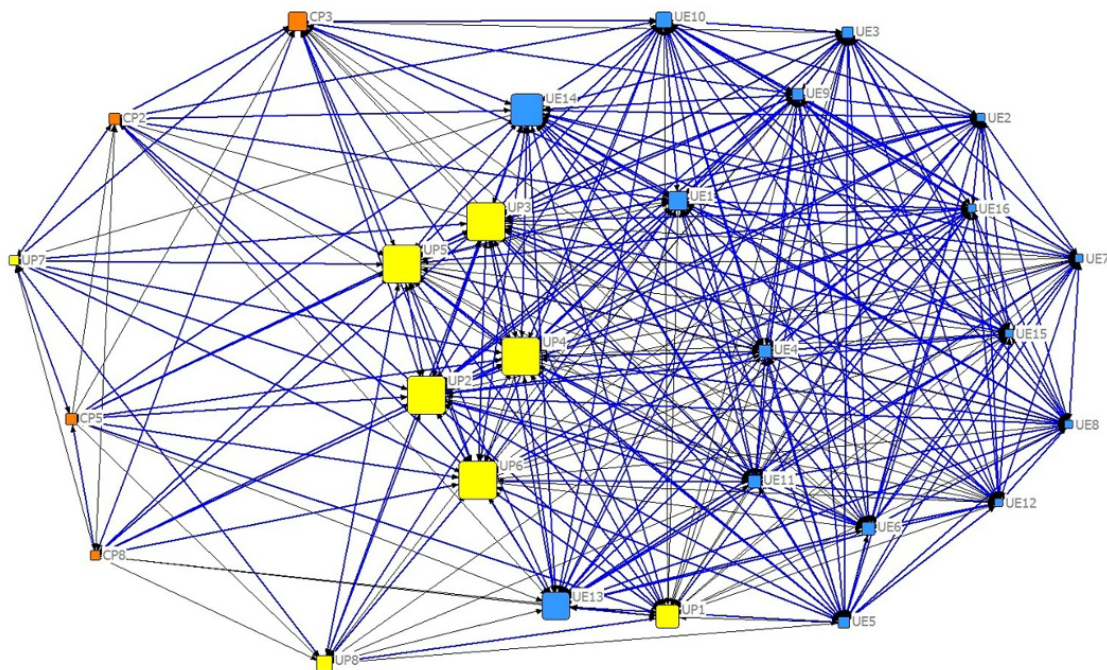
Legend: Blue square: UE; yellow square: UP; orange square: CP. Blue link: reciprocity; black link: no reciprocity. Node size: betweenness (for a further interpretation, refer to Tables 1 and 5).

e. Relational subgroups (factions and cliques)

In the analysis of factions, the optimum resulting number of cohesive groups (Figure 2) was very stable and there were 6 (a correct proportion of 0.795). When forcing an increase in the number of groups, a division appeared earlier within the public model than within the private one, which even took place for groups with a single member. However, the private model midwives maintained very close stable links and formed a very close group, which resists the fragmentation process. This is particularly significant bearing in mind the difference in the size of both groups (fragmentation is expected in the more numerous group, this being the private model).

In the analysis of cliques, 13 groups appear in the occupational relationships network (Figure 3). The first encompasses nearly all the private model midwives (79 %), with none from the public model. For the other cliques, it should be highlighted that a set of midwives that belongs to the private model and PH (UP2, UP3, UP4, UP5 and UP6) appear in all of them (marked with a red square in Figure 3). Finally, the participation of the public model actors in cliques is scarce, but increases as the participation of the SH actors lowers. It can be generally stated that the results on the presence of midwives in the different cliques correspond well with those obtained in the centrality indicators, which is expected in relatively small networks with a high density.

f. The E-I Index

Work was done with two attributes, healthcare level and management model. Regarding the former, the SH midwives obtained an E-I = -0.01, with an E-I = -0.33 for the PH midwives. This implies a balanced

Figure 2
Factions. The occupational contact network (6 groups).

Legend: Colours represent different groups. Blue link: reciprocity; black link: no reciprocity. Node size: in-degree (for further interpretation, refer to Tables 1 and 5).

Figure 3
Cliques from the occupational contact network.

Legend: Blue square: clique; Yellow: UE; orange: UP; green: CP.

combination of internal-external relationships among the SH midwives, but moves towards homophily with the PH midwives. When dividing the sample according to management model, the private model midwives obtained an E-I = -0.84, *versus* E-I= **+**0.56 for the public model. In other words, a public model emerges in which openness trends predominate, as opposed to a clearly endogamous or very closed private model.

g. Brokerage

For the brokerage analysis, work was done using several types of combinations of attributes, firstly with the healthcare level and the management model (Table 6). Depending on the healthcare level, the greater brokerage capacity lies with the PH midwives (56.2 %), which almost doubles the average per actor for the SH midwives (4.7 % *versus* 2.7 %). This difference becomes more pronounced for the management model because almost the whole broker-

age capacity concentrates in the private model (95.5 %), which nearly quadruples their individual average compared to the public model midwives (4 % *versus* 1.1 %). Thus, as with other indicators, belonging to the private management model conditions brokerage capacity even more so than the healthcare level.

Secondly, when viewing the results of the node betweenness (Figure 1), the sample is divided into three actor groups where the previous attributes are combined: the private model and SH midwives; the public model and PH midwives; the private model and PH midwives (Table 6). It should be noted that all SH belonged to the private management model, whiles all those belonging to the public management model were working in PH. These results indicate that the PH private model midwives occupy the best positions because, as they are only one third of the sample, they concentrate more brokerage capacity, and the other two groups are below that expected if a

Table 6.
Brokerage capacity according to the actors' attributes.

Attributes	Groups	Actors (%)	Brokerage (%)	Mean per actor
Healthcare level	SH	57.1	43.8	2.7
(Primary / Specialised)	PH	42.9	56.2	4.7
Management model	Private	85.7	95.5	4.0
(Public / Private)	Public	14.3	4.5	1.1
Private + PH	Private-PH	29	51.7	6.5
Private + SH	Private-SH	57	43.8	2.7
Public + PH	Public	14	4.5	1.1

Table 7
Analysis of the five types of individual brokerage.

Attributes	Groups	Brokerage type (Attribute = 100 %)				
		Coordinator	Gatekeeper	Representative	Consultant	Liaison (*)
Healthcare level	SH	1.5	12.9	26.2	3.2	0.0
	PH	6.8	21.5	27.8	0.1	0.0
Management model	Private	49.0	24.7	20.9	0.9	0.0
	Public	0.1	0.8	1.9	1.7	0.0
Private + PH	Private-PH	1.0	10.9	14.7	0.8	24.3
Private + SH	Private-SH	1.5	12.9	26.2	1.0	2.3
Public + PH	Public	0.1	0.8	1.9	0.3	1.4
Attributes	Groups	Mean per actor				
		Coordinator	Gatekeeper	Representative	Consultant	Liaison (*)
Healthcare level	SH	0.1	0.8	1.6	0.2	0.0
	PH	0.6	1.8	2.3	0.0	0.0
Management model	Private	2.0	1.0	0.9	0.0	0.0
	Public	0.0	0.2	0.5	0.4	0.0
Private + PH	Private-PH	2.3	23.6	31.8	1.6	52.6
Private + SH	Private-SH	1.6	13.9	28.3	1.1	2.4
Public + PH	Public	0.5	3.5	8.3	1.3	6.0

(*) The function of the liaison-type brokerage takes place only when there are at least three actor groups (see Table 1).

proportional distribution of brokerage capacity exists (which is unreal as not all actors play the same role in the social network). In any case, they clearly remain below the actors in the PH private model. The average values move in the same direction as they are significantly higher for the PH private model group (6.5 %, *versus* 2.7 % in the SH private group, and 1.1 % in the public model).

This overall brokerage capacity can be broken down into five functions or possible types (Table 7). Gatekeeper and representative are the most important functions at the two healthcare levels; that is, channelling relationships from and to each one. This would facilitate brokerage between both the healthcare levels. Regarding the management model, the high brokerage concentration is stressed in the private model, where almost half is internal coordination (49%), while the other significant part is divided into channelling relationships from and to the public model. Although this may be a result conditioned by group size, it also influences its own internal dynamics. At any rate, the result shows that the public model midwives generally have a much more limited brokerage capacity than the private model midwives.

These results reinforce those obtained for the E-I Index, where a strong endogamy is found in the private model (in line with the high coordination brokerage for this group), along with the open nature of the public model, where this type of brokerage does not appear, although the consultant type does (according to the individual averages). The small group size of the public management model possibly conditions

its need to intermediate towards the private model, which is much bigger, but this does not justify its lack of internal coordination.

When analysing the values according to three groups and brokerage type (Table 7), despite the "representative" being more important in the network series (it represents 43% of total brokerage capacity), given its strategic character, the high liaison-type brokerage capacity of the PH midwives in the private model is especially emphasised. In other words, establishing this brokerage tends to be more complex and is more costly to maintain because the brokerage groups differ from one another, and they partially differ from the actor acting as a broker.

The strategic role of brokerage capacity depends not only on the type, but also on its degree of concentration. To display this graphically, actors are grouped according to their individual brokerage percentage. The first group represents only one quarter of the midwives, but concentrates 57 % of brokerage capacity (Figure 4).

This means that power is well concentrated in only a few key actors, which represents a "hard core" species of compound brokerage, as expected mainly for the actors in the private model and in PH (UP2, UP3, UP4, UP5 and UP6) and for a single actor in the private model in SH (UE14). Moreover, this "hard core" is what concentrates almost all the strategic liaison-type brokerage, while the third group (the public model) is virtually absent in the potential brokerage tasks of the social network.

Figure 4
Distribution of brokerage capacity (hard core group versus total social network).
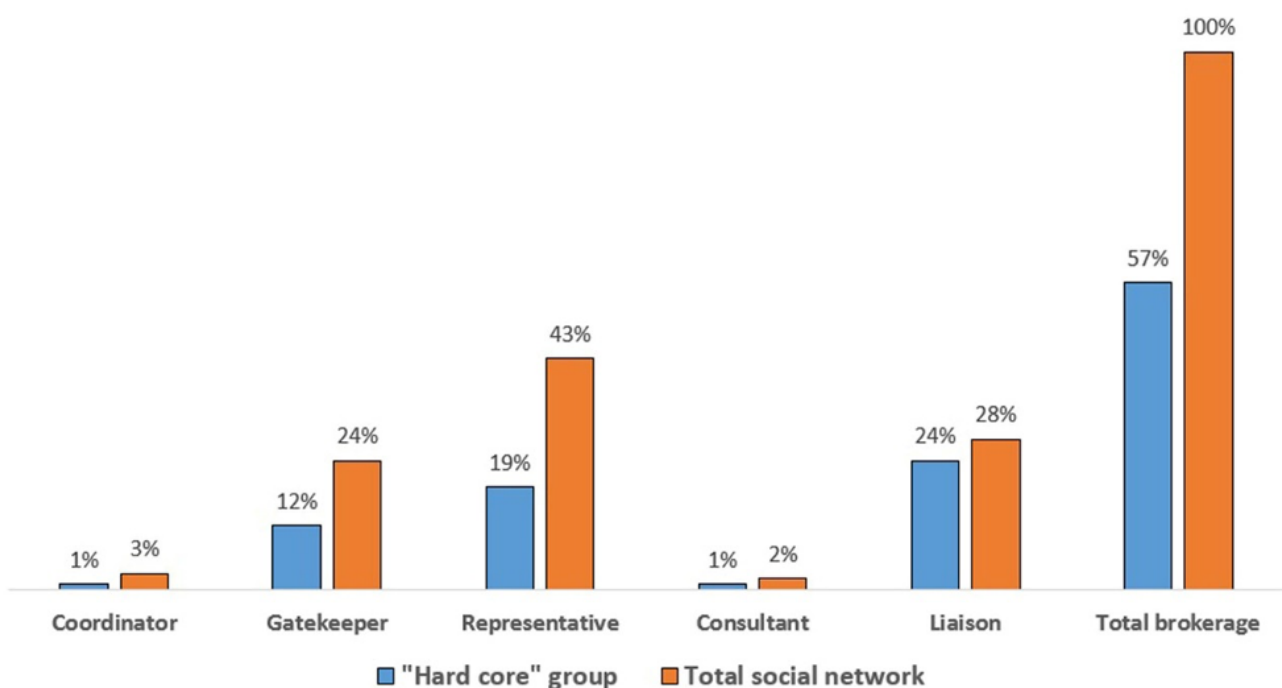
DISCUSSION

The present study attempts to assess whether the existence of two human resources management models (private *versus* public) in the La Ribera health area in Valencia, Spain, conditions the efficiency of the services provided by midwives to a greater extent than belonging to a given healthcare level (SH *versus* PH). According to the obtained results, it is possible to state that the efficiency of services is more conditioned by the human resources management model than by the healthcare level from which they are provided. These are the results that stem from applying the methodological SNA approach, particularly when referring to relational density for groups, cohesive groups (factions) and degree of openness *versus* homophily (E-I Index).

This outcome clashes with the strategic objective of this PPP, which intends to achieve comprehensive management (the integration of SH and PH to enable seamless patient care experiences) in the health area of La Ribera (Tarazona, de Rosa and Marín 2005). The search for continuity of care is not an exclusive objective of this PPP but is present in any health management model. For instance, studies that refer to the Spanish health domain suggest a unique management structure, including those of both healthcare levels, as a way to guarantee continuity of care (Ojeda, Freire and Gérvas 2006) and healthcare coordination (Henao, Vázquez and Vargas 2009). The last study points out that the differences caused by distinct occupational agreements in one same company create a working environment that does not favour coordination, particularly as far as differences in working hours, salaries and incentives are concerned (Henao, Vázquez and Vargas 2009). In international spheres, the interest of health professionals in achieving better collaboration between PH and SH stands out (Waibel et al. 2016; Schölmerich et al. 2014; Robinson 2010), and is known as integrated care (Stewart et al. 2017; Lillrank 2012). However, the pending question is how it can be suitably implemented (Perdok et al. 2014).

The results obtained in the present study herein reveal that a particularly cohesive group is found among the midwives in the private management model (with a high density of internal relationships) that is also somewhat endogamous (poor external relationships). This result implies two interpretations as this good cohesion is a strong point that moves in the right direction as sought by the healthcare strategy of this PPP. As pointed out by Tarazona, de Rosa and Marín (2005), the healthcare strategy is based on promoting knowledge among different professionals from the area, establishing joint action guidelines and defining common objectives for the health area to offer comprehensive health care to patients. Moreover, according to the results obtained, the fact that

the public management model midwives occupy a peripheral position, are further away and are weakly connected with the strongly cohesive group of midwives who belong to the private model, can be less positively interpreted. In line with this, in a qualitative study done with the same population studied here (midwives from the La Ribera health area), three aspects stand out for those linked to the private management model: greater healthcare pressure in relation to their public management model colleagues; the existence of "airtight" compartments being perceived; and the healthcare management dealing with their public management model colleagues differently (Camacho-Morell et al. 2019). Thus, it can be concluded that the healthcare strategy of this PPP has been successful, in the area covered by the present study, in creating a very cohesive internal group of midwives. However, this success has to be played down because its efficiency would have been greater if it had better integrated and included more public model midwives compared to those in the private model.

The network indicators gave a clear definition of the subgroup formed by the PH midwives from the private model, with a very high relational potential as it bridges (brokerage functions) its SH working colleagues in the private model, as well as the PH working colleagues in the public model. Thus, a greater and better integration of the midwives of the public model (all in PH) could take place taking advantage of the privileged position of intermediation of PH midwives of the private model.

This result is in line with that obtained by Waibel et al. (2016) where users indicate that the health care model whose central axis is PH is the most appropriate to provide continuity between levels of care. It also points out that PH professionals are the best placed to perform the functions of gatekeeper and coordinator (Waibel et al. 2016), such as in the present study. In turn, in the SNA study of Groenen et al. (2017), community-based midwives (comparable to PH midwives in Spain) showed high scores in connectivity, which leads the authors to believe that those midwives are essential in connecting the different professionals in the network.

In the present study, the other actors who obtained high scores in connectivity (UP2 and EU14) were two midwives working in middle management positions. This result is consistent with that obtained in the SNA study by Boyer et al. (2010) in France, in which middle managers emerge as those with high levels of centrality, prestige and cliques. This crucial role of middle managers is also reflected in the study by Valentino (2004), who considers them to be change agents and capable of attracting and encouraging people in a new organisation. Therefore, in response to the question raised by Perdok et al. (2014) about

how continuity of care can be suitably implemented, the results of the present study point to the strategic role that midwives can play in middle management (UP2 and EU14) and in bridging the gap between subgroups (midwives in SH and private model management). Awareness of these key actors can improve the continuum of care between PH and SH, and thus the efficiency of the system, as some authors have pointed out (Kroll-Desrosiers et al. 2016; Schmied et al. 2010).

From the methodological point of view, this study verified the potential of the SNA as a methodological tool to study social relationships in the health area. Although many reviews have appeared in recent years on research conducted with this methodology in the health domain (Tasselli 2014; Chambers et al. 2012; Smith and Christakis 2008; Luke and Harris 2007), very few studies have specifically dealt with networks of health professionals (De Brún and McAuliffe 2018; Cunningham et al. 2012; Oliver et al. 2012). Furthermore, the research works from the SNA perspective that refer to the maternity care process are even scarcer (Groenen et al. 2017), and to this date there are no contributions specifically linking the analysis of maternity care and health PPPs from the SNA approach. The samples of the interviewed midwives represented 90.3% of their population in the study area, which exceeds 75% of the responses considered necessary to take an SNA sample as being reliable (Borgatti, Carley and Krackhardt 2006). Consequently, using the SNA approach allowed those professionals with greater centrality in the network to be described. These actors, who occupy leadership positions, are capable of making changes in the network as a whole, and the SNA enabled these actors to be suitably identified (Valente and Pumpuang 2007), as well as a few actors who acted as a bridge between subgroups. This concentration in key actors is consistent with the results obtained with SNA in other areas (Esparcia and Serrano 2016).

The present study reliably reflects the situation of a given group (midwives) within a time frame (2016) and in a certain geographical location (the La Ribera health area). These results cannot be generalised to other health professionals in this health area because each unit or service is a group with its own characteristics, as pointed out by Boyer et al. (2010). Nonetheless, this does not fail to imply, as Schroeder et al. (2012) suggest, that even though a study belongs to a given context, its results can contribute to the improvement of overall knowledge about a given issue.

Working with a fixed picture entails certain limitations, and having a longitudinal study would be more useful (Ramos-Vidal 2019, Hoeve et al. 2018; Boyer et al. 2010). Although the SNA approach also provides the opportunity of exploring the longitudinal im-

pact of reorganisation on workforce and on inter-organisational networks (Groenen et al. 2017; Oliver et al. 2012), there are alternative approaches that could be useful for that purpose. Thus, interventional and quasi-experimental design (Marek et al. 2006) could be used. Other authors point out the need to include qualitative methods to make sense of the structural indicators and to provide information about the context in which social interactions take place (Luke 2005), or the utilisation of vector autoregression models, where the efficiency of a specific intervention across time can be tested (Brandt and Williams 2007).

Regarding the present study, and in the context in which it was conducted, it is important to point out that this PPP was returned to the Public Health System in April 2018. It is still too early to assess whether this reversion will spell more efficient health management, as some studies have found strong and weak points in both models (López-Casanovas and Llano-Señarís 2017; Caballer-Tarazona and Vivas-Consuelo 2016; Barlow, Roehrich and Wright 2012; Rechel et al. 2009). However, the reversion to the public model may not be a solution of the problem of duplicating human resources models given that after its reversion two very different groups still co-exist (those midwives belonging to the former private model and those belonging to the public one, both of them with a different status). Thus, once again we face two human resources management models which the Public Health System is now in charge of. The advances and results of this co-existence will have to be analysed in the mid-term (5-7 years), which would complete the results obtained to date. That analysis, even if made from the approach of SNA, would allow to complete the aforementioned longitudinal perspective (as suggested by Groenen et al. 2017).

Other very interesting and complementary research lines can be explored in the future, such as the mechanisms for coordination from different professional categories (e.g. the relationship between midwives and gynaecologists), as in the study by Schölmerich et al. (2014). Here the methodological SNA perspective would be a novel aspect, which may be most useful. It would also be very interesting to introduce the user perspective, as pointed out by Schölmerich et al. (2014), where pregnant women were found to have an unexpected communicative role in transferring and correcting information between PH and SH midwives.

CONCLUSIONS AND NEW PROSPECTS

The obtained results allowed the present study's initial hypothesis to be checked: the co-existence of two human resources management models (private *versus* public) in the La Ribera health area can determine the efficiency of the services provided by

midwives, rather than belonging to a given healthcare level (SH *versus* PH). This research hypothesis has been confirmed by the consistency of results obtained mainly from the E-I Index.

Regarding the objectives set out, a higher density of relationships and greater cohesion were found for the group of midwives in the private model, who formed a clearly endogamous group. At the same time, this is both a strong point (given the efficiency of the care provided) and a weak point (as it does not open up outwardly). In the public model, midwives sit on the periphery of the network and their collaboration fails not just with midwives from the same model, but also with the private model midwives.

As regards the actors who act as bridges among subgroups, all the performed analyses coincide in emphasising the essential role played by the midwives who work in PH and belong to the private model. On the other hand, the results also clearly highlight the crucial role of two middle managers actors, both in relation to internal cohesion, as well as in the

intermediation between both healthcare levels (PH and SH).

The fact that this PPP has recently been reversed and returned to Public Health System suggests a very interesting dynamic scenario to be explored in the mid-term as a future research line, as would studying the other actors who would also intervene in maternity healthcare and from the user point of view.

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