Participation in Cardiovascular Health Awareness Program (CHAP) by the Elderly Residents of Social Housing in Quebec: Social Network Analysis

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Abstract

Background: The Cardiovascular Health Awareness Program (CHAP) was originally developed and evaluated as a community-based cardiovascular disease (CVD) prevention program in small to medium size communities in Ontario. Recently, CHAP has been adapted to target older individuals living in 14 social housing buildings in Ontario (7) and Quebec (7). The participation rates in the 10-months program varied across buildings in Quebec from 23.5% to 49.1%. Social network analysis (SNA) has been successfully used to assess and strengthen participation in health promotion programs. We applied SNA methods to investigate whether interpersonal relationships between tenants within buildings influence the participation in CHAP.

Methods: We used sociometric questionnaires and complete network analysis, supplemented by qualitative interviews to examine relational dynamics of two buildings in Quebec with a low and a high attendance rates. All residents of the two buildings were eligible to be interviewed for the sociometric questionnaire. The participants for the qualitative part of the study were selected at random.

Results: In total, 69 seniors participated in the study, including qualitative interviews. Among study participants selected for qualitative interviews, 10 attended almost all CHAP sessions, 10 attended once and 12 did not attend any. Quantitative results helped to identify well-known and appreciated local leaders. In building 1 which had a high attendance rate (34.3%), there was a main leader (In-degree or 'named by others' frequency 23.2%) who attended all sessions. In building 2 which had a low attendance rate (23.9%), none of the leaders had participated in CHAP sessions. Qualitative analysis showed that tenants who did not attend CHAP sessions (or other activities in the building) generally preferred to avoid conflicts, retaliation and gossip and did not want to get involved in clans and politics within the buildings.

Conclusion: In order to increase attendance at CHAP sessions among residents of subsidized housings for seniors, we identified 4 potential strategies: increase participant confidentiality; deploy community peer-networks to enhance recruitment; pair attendants to ensure their future participation; intervene through an opinion leader or through bridging individuals.

Contributions To The Literature:

- This study fills an important gap in the literature; very few studies provide an in-depth understanding of the relational dynamics between elderly neighbors and how this influences their participation in health promotion programs
- This study generates new knowledge on the implementation of health promotion programs in the context of subsidized housings
- Ultimately, by better understanding the relational dynamics which influence attendance will allow to optimize the implementation strategies of health promotion programs targeting vulnerable seniors.

Background:

High blood pressure (hypertension) is one of the most important risk factors for death and disability in Canada and globally (1). The Cardiovascular Health Awareness Program (CHAP) is a community-based, patient-centered hypertension prevention and management program targeting key modifiable risk factors and aimed at older Canadians. CHAP connects community resources with health system actors (primary health care providers, peer volunteers, local community organizations and other health professionals) in order to improve cardiovascular health of participants. During a CHAP session, blood pressure is measured following Hypertension Canada recommendations, and participants are assessed for cardiovascular diseases risks in familiar settings such as pharmacies, places of worship, and other community spaces. Trained volunteers help participants understand their risk profiles and provide locally available resources and support program information. With participants' permission, blood pressure readings and cardiovascular disease risk profiles are shared with their physician.

CHAP was previously successfully implemented and evaluated as a cluster randomized controlled trial in 39 mid-sized communities in Ontario and was associated with 9% reduction in annual hospital admissions for acute myocardial infarction, stroke, and congestive heart failure (2). Subsequently, CHAP has been adapted and implemented in multiple settings and populations such as interdisciplinary primary care clinics, patients on a waiting list for a family physician, ethno-cultural minorities and younger people. Recently, CHAP has been adapted to target older individuals living in social housing buildings in Ontario and Quebec and its effectiveness is being evaluated using a cluster randomized controlled trial. This adaptation of the CHAP program included, for the first time, group-based monthly educational sessions aimed at increasing cardiovascular health awareness to promote healthy habits and self-management among residents (3). The elderly living in social housing represent a vulnerable population and are more likely to be affected by multiple chronic conditions such as cardiovascular disease and diabetes (3), have more falls (4), and have poor health literacy (5).

Implementing a health promotion program targeting the elderly tenants in subsidized housing has many challenges (6–8). Social Network Analysis (SNA) can be a useful method to understand the role of interpersonal dynamics between residents and their impact on attendance in health promotion programs such as CHAP (9). Social network methods started to be developed in the 1930’s have rapidly proliferated in many research fields such as physics, epidemiology, public health, and medicine (10, 11). SNA shifts the object of studies from the individuals to the relationships they have with others (11). Several studies have shown that the expected effects of an intervention can vary according to the social networks dynamics of the beneficiaries (12–15). These dynamics mediate whether people benefit from the program or not (13, 16). For example, programs implemented by community members identified as leaders have shown to be more effective (13) than programs offered by external organizations (17, 18). Identifying well-known and appreciated leaders (central in the network) who are from the community, influence opinion and act as change agents is crucial as their support or opposition is critical to successful implementation of a program. As they have a great understanding and knowledge of their community dynamics and needs (9, 13, 17), they can represent key informants to help adapt the program

to the local environment, and can impact on its sustainability (9, 17). Identifying the wrong person as a key-agent to implement a program can interfere with the benefits of the program (9, 10, 19, 20).

A better understanding of the role of interpersonal dynamics between residents of a building on the individual's decision to participate in health promotion activities could assist with more effective recruitment strategies to enhance attendance. For example, neighborhoods may have a more significant role for the elderly population (20–22). Proximity and involuntary relationships (that cannot be easily avoided) seem to represent the main type of interactions with others (20). These types of ties seem to generate conflicting relationships particularly in or near poor neighborhoods in large urban areas (10, 19, 20). Thus, instead of being a source of support, relationships can represent a negative resource that can interfere with the health of a person (10, 23, 24). Positive and negative aspects of the neighborhood relationships produce distinct influences such as withdrawal and isolation or participation and feeling of belongings which mean that even if a relationship may be a source of distress, the positive aspects of the relationship can be an important motivation to maintain the relationship (19). In this particular context, there is a crucial need for seniors to be able to develop different proximity and distance strategies with neighbors (20) that can have an influence on the attendance at CHAP sessions.

SNA can generate a relational portrait of the environment in which CHAP is implemented, and help understand the influence of interactions between people on the differences in attendance across buildings. SNA is not sufficiently utilized in community-based program planning and evaluation but has the potential to help understand why people attend or not programs in their community (9, 13, 17). This main objective of this study was to use a social network analysis (SNA) approach to evaluate whether relationships and social structures among residents affect participation in the program. The specific objectives of this study were to: 1) Describe the dynamics of relationships between tenants in subsidized housing attending CHAP sessions; 2) Examine the impact of these dynamics on program attendance rates.

Methods:

Research Design: Social network analysis

We used SNA methods to examine whether relational dynamics could explain the differences in attendance rates at CHAP sessions between buildings. We aimed to describe complete or global networks of each of two buildings, one with a low and one with a high attendance rate. SNA combines quantitative and qualitative research methods to study and measure relationships (friends, family, and neighbors) by analyzing different links – who is connected to whom – as objects of study (18, 25). The network data we collected were composed of several measures such as centrality and in-degree, used to identify the diffusion potential of an innovation (CHAP session attendance and/or lifestyle behavior) in a network (26) We also used the network data to identify if there was a person or a group who had the power of influence such as network's opinion leaders or bridging individuals, individuals that are instrumental to reach disconnected sub-groups (10, 27).

Setting

Implementation of CHAP in subsidized housings for elderly over 60 was part of a randomized cluster trial (RCT) in 28 buildings (14 intervention and 14 control) in Quebec (Montérégie), and in Ontario (Niagara). This social network analysis was completed in the Quebec arm of the RCT. The CHAP sessions took place once a month in community rooms of the buildings participating in the program, between September 2018 and June 2019.

The 3-hour long CHAP sessions were conducted by trained volunteers (assessment protocols, privacy/confidentiality, and consent), supervised by a research nurse and included: BP measurement, anthropometric measures, CANRISK and CVD risk assessment. Participation in the sessions was on voluntary and on a free drop-in clinics basis (duration 20–40 minutes). In collaboration with tenants association or a voluntary tenant of the building, all tenants were invited using several recruitment strategies: meetings with social housing representatives, with tenants associations, posters, flyers, door-knob flyers, and automatic telephone reminders (3). The participation was defined as attending at least one CHAP session and the rates of participation varied across buildings in Quebec from 23.5–49.1%. Group-based educational session followed each diabetes and CVD assessment session. The 9 monthly health educational sessions were held in the form of workshops or conferences, and were facilitated by different organizations or partners, and addressed a different theme each month (diabetes, wellness, paramedic services, preparing a visit to a family doctor, chronic pain, diet, physical activity, hypertension, and pharmacy services).

Data collection

The study involved two stages of data collection, quantitative and qualitative. The quantitative stage consisted of gathering data to examine the relationships between each person with all the others (complete networks) (24, 28), and consisted of exploring the relationships between all the residents of two selected buildings. This methodology involved interviewing at least 25% of all building residents, to ensure centrality measures as in-degree (leaders), groups membership (diffusion mesure) as indicators of network position (29). The two buildings were selected using attendance rates and similarity in terms of general layout (conditions and presence of tenants association). Since the building with the best participation rate (49.1%) had ideal participation conditions according to the literature (green spaces, services and few tenants per building), we chose the building with the second high participation rate. A total of 150 residents were eligible to participate and were approached directly at their door. Data collection was done at their apartment or in the community hall and lasted approximately 60 minutes per person.

The collection of network information was done through sociometric questionnaires supplemented by coding grids indicating the names of residents identified by the respondent and the types of relationships. Furthermore, in order to assess the quality of these relationships, respondents were asked to designate the named neighbor as a friend, acquaintance, a neighbor or like family. They were also asked to specify whether they share activities with the person, confidences, advises, information, exchange services, trust

(fully, moderately, not at all), conflicts or other potentially interesting themes, in order to generate a portrait of the relational dynamic between tenants (24, 28, 30, 31).

Second, qualitative data was gathered on relationships but also proximity and distance strategies between neighbors. For this part, we randomly selected the participants and were guided by the principle of content saturation (32). We aimed to interview 5–7 persons who attended 3 sessions and more, 5–7 tenants who attended one session only, and 5–7 individuals who did not attend any CHAP sessions. The qualitative interviews were recorded and supplemented by coding grids. We covered topics such as everyday life (typical day), loneliness, relationships with neighbors, family, friends, acquaintance (support and conflicts). Multiple factors can influence the establishment of ties with other residents, such as the presence of strong external ties (friendship, family) (20, 30), which is why we have included relational information outside the building in our analyses.

Analysis

The data were analyzed with ORA (SNA software), for the quantitative part using a structural analysis method (9, 13, 24). This software measured clustering (groups and sub-groups), centrality (leaders) and other significant network measures relevant to assess the network's dynamic. The qualitative part was a thematic analysis (32) done with N'Vivo using the deductive/inductive method.

Results:

In building 1, out of 100 residents, 42 (42%) people were interviewed (23 for sociometrics, 19 qualitative), 32 women and 10 men with a mean age of 74 and 38 live alone. 20 persons have never participated to CHAP sessions, 9 only one time and 13 two times and more. In building 2, 27 (54%) people out of 50 residents were interviewed (14 for sociometrics, 13 qualitative), 19 women and 8 men with a mean age of 70, 12 living alone, 10 in couple, 2 widowed and 3 living with another member of the family. 16 persons have never participated to CHAP sessions, 7 only one time and 4 two times and more.

Maps of complete network

Using the quantitative data to identify the people in their network and the links between other known neighbors even if they were not close to them (31, 33), we were able to map the connections for 75% of the building 1 and 92% of the building 2.

The maps of the complete networks of the 2 buildings (Figs. 1 & 3) illustrate the centrality of certain tenants in the buildings and the distribution of conflicts. People in the center of the maps are more central in the buildings' networks, which means that others name them more frequently. The links in grey represent the connections (knowing the neighbor) and the links in red represent conflicts they had with the named neighbor. The node names represent the gender (M for male or F for female) and the number of CHAP sessions attended (0 to 7). According to the type of relationships residents identified with from

the coding grid, these persons were consulted when they needed information, services and wanted to attend building activities.

In the next two maps (Figs. 2 & 4), the links representing conflicting relationships (red links) and people who did not attend and were not directly connected to someone who attended (green nodes) had been removed. These maps aimed to illustrate the direct diffusion opportunities between people in each building. In the building 1 network configuration, we could reach 59% residents and 82% in the building 2. By removing conflicting links we could identify the main actors of diffusion in each building.

Social Networks in Building 1, the leader makes the difference

In building 1 (Fig. 1), which has a relatively high attendance rate (34.3%) at CHAP sessions, there were 2 clans (identified with qualitative interviews and network measures). A recent conflict between the leaders of these two clans in the building had an effect on different activities (including CHAP session attendance). Figure 1 shows that a clan leader had many red links (conflicts), one of which is with the other clan leader. This person did not attend any CHAP sessions for this reason, because the other person participated in all sessions. The first clan chief was a leader (F6 in centre) with 23.2% In-degree ('named by others' frequency). She attended all sessions, which may explain the fact that this building still had a high attendance rate. This position of leader for F6 was confirmed after having removed the conflicting links (Fig. 2) with a total degree (total of links when 'someone named others' and 'be named by others') of 28.4% for F6 and 0.17% for F0.

In addition, the In-degree ranking indicates that 4 out of 6 of clan 1 attended at least one session, versus 2 out of 6 for clan 2 (Fig. 1) which illustrates the group influence of clan 1 in CHAP attendance. The map of diffusion potentialities in the network configuration of building 1 (Fig. 2) shows that the total degree remained high for the leader (F6), which means that she remained a main actor of diffusion and a key-agent for the CHAP implementation (before, F6 18.2% and F0 11.6% ; after removing conflict links F6 28.4% and F0 0.17%).

Social Networks in Building 2, the hidden bridge

In building 2 (see Fig. 3), which had a lower attendance rate (23.9%), the leaders (FM0) had 32.7% In-degree and did not attend any sessions (0 out of 7). There is also a presence of 2 main clans in this building. The presence of conflicts indicates that there were more conflicts around the central leader than around the peripheral leader. The In-degree ranking indicates that 5 out of 6 tenants from clan 1 did not attend and 1 out of 6 had attended one time. We can see that in this network configuration (Fig. 4), the total degree (in and out degree) changes between the leaders (FM0) and a CHAP participant (F1) who was not identified as central (only 2% In-degree). Before removing conflicting links, FM0 had 27.6% and F1, 17.3%. After removing conflicting links, F1 goes up to 19.5% and FM0 goes down to 13.4%, which means that F1 is the most important person in this building to promote the program activities in the building. This person is, with M0 (in Fig. 3), a main actor of diffusion and a key-agent for the CHAP

implementation, whom we should have involved in the program diffusion strategies. Thus, F1 is a common relation to the two cited main leaders and represents a kind of bridge in this divided network.

Proximity and distance strategies from residents

Qualitative analysis has shown that residents of both buildings adopt proximity and distance strategies in the relationships they have with neighbors, and that there are some variations in degree. The first level of **proximity strategies** represents general polite behaviors: *"There is this woman that I often chat with. She likes to sit on one of the chairs in the indoor lobby downstairs. Whenever I see her there, we wave to one another. You could say that this is a kind of interaction. .. Yeah, we greet each other, and then maybe just say a few words, nothing more." (R8/F1)*. Most people appreciated greetings and respect for an acceptable noise level. In addition, some were willing to exchange some services occasionally and this means that they were sharing closer relationships with some neighbors, especially with people who were highly involved in the community and/or members of tenants association and local leaders. A greater level of proximity is also seen when some have few (1–2) people with whom they make regular exchanges of services and visit: *"R: Sure, sometimes I'll just go there or sometimes we just help each other out in small ways. For instance, if I make a big batch of homemade soup, I might bring some of it to neighbors who have done me a favor. These are the kind of encounters I have. Q: How about meeting for activities? R: No, that hasn't happened." (R3F/F0)* Or confide and share activities: *"Well, I know XY: I see her pretty often, especially when there are activities down below, or whenever she walks her dog. .. and then there is X and Y, who I would say are good friends." (R2F/F0)*. They also demonstrate their connection by helping more in case of illness or by larger services during the more serious illness, rather than only helping in emergencies. The highest level of proximity is to contribute to the community through volunteering or by being members of the tenants association.

People participated in different activities for a variety of reasons, among other things, to socialize with people and create new friendships. However, some did not need participation in activities to rub shoulders with people. Some people tended to be more involved because of the participation of (a) particular person(s) in the same activity: *"Yes, I did go to the CHAP session once. It's the kind of thing I go to with X and his girlfriend. I had asked them to come with me.* […] *because I am not really all that comfortable going there alone yet. Once I get a better sense of who is there and how it unfolds, I'll probably go on my own. But right now, I am still just checking it out." (R9/F3)*. Tenants, instead, preferred to focus on the activity rather than the interaction between neighbors: *"When I do go to one of those places, it is usually because I like going there and I want to learn something." (R6/F4).*

The majority of tenants also mentioned using **distance strategies**. First, several only helped in case of emergency, for example, power outage, fall, or they charged for the services they render. Then, a widely used strategy was the avoidance of neighbors in common spaces. Sometimes they wanted to avoid a particular person they have a conflict with: *"I try not to bump into her whenever possible. For instance, I avoid opening my front door when I know she is behind." (R1/F1)*. Sometimes they adopted this behavior as a habit: *"I go when I think no one is there, but if I see someone, I immediately turn around." (R2/F4).* This strategy seemed to be used particularly to avoid conflicts or being judged: *"I am just afraid of*

making a bad impression on others. .. so because I worry about that a lot […] *So I have become really withdrawn as a result. I can't stand conflict."(R1/F1)*; or to be included in gossip sessions: *"I am just not the kind of person who wants to get close to neighbors. Gossip turns me off." (R3F/F0)*; or even to be caught in clans: *"Yes, there can be tribalistic behavior here. In fact, that is the main reason why I decided to take a distance from people I had established relationships with." (R7/M0)*.

The reasons for conflicts can be the noise, divergent opinions, personal attacks, gossip, etc. In addition, more personal problems such as negative behaviors or strong personalities cause tensions. These conflicts may be current, past and may have caused break-ups and stopped the mutual assistance that was once present, and some can become reluctant to form new relationships with neighbors. These same reasons also justify the isolation of some. Many appreciate or are used to loneliness. There is also the presence of relatives there for them occasionally and living outside the building that influences their withdrawal from neighbors and makes loneliness more appreciable. However, not the totality of people live well with loneliness and some people express some distress regarding the relationships they have with neighbors: *"Maybe it is because I am not in a good head space right now…because, you know, I don't think I am a bad person and I certainly don't mean anyone harm, but I don't like how people treat me here* […] *they remind me that I am worthless, or worse. And so that is how I feel now: worthless." (R10/F4)*

This portrait needs to be nuanced by the fact that it is not possible to strictly classify people in these two separate types of strategies. The interviews show a deeper ambiguity. For example, a person can help a neighbor intensively during a period or be friends with them and start afterward to avoid this person because of a time consuming relationship, problem of trust or health that make the respondent not be able (or not want to) to continue this relationship. On the other hand, a person can sometimes use a distance or proximity strategy and a mix of both in the daily life depending on the mood, the health, the people they meet: *"On the one hand, I need to keep to myself and I need to live alone, and on the other hand, I don't want to be all alone all the time. I do need to see people sometimes and then after I do, I need to be alone again to get back to my peace and quiet." (R6/F4)*

Reasons for attending and for not attending CHAP sessions

Regarding the **reasons for attending** the program, they were related to the program's objectives namely, knowing the health status, checking the blood pressure, following up with the doctor, acquiring new knowledge through conferences, motivation to take care of oneself: *"I go once in a while. The last time, only went to attend the nutritionist's talk on healthy eating. I found it really interesting."(R2/F4)*. Some participants attended the sessions for the benefits of the program and because even if they don't appreciate social interaction, they met a person there they were comfortable with:*"I go to those sessions to get my blood pressure checked. There is only one or two people that I chat with. Because, as I see it… most women show up in pairs, they are always in pairs of two. .. There is one person that I regularly talk to and it is always chill between us. That has been my experience. Q: Is that really the extent of your interactions? R: I have very, very few. I am telling you…I am not comfortable with social interaction. .. I think I have put a wall around myself." (R2/F4)*. Moreover, some attendants came to the CHAP sessions because a neighbor invites them to the activity. For example, respondent R1 who is generally isolated

from the neighbors did come once: *"When X told me about it and said she was going, I said to her, 'Alright, I'll come with you.'"* but also said that *"The only reason I don't go is because I don't want to see any of my neighbors."*

Besides the fact that some respondents didn't feel the need to attend CHAP sessions because they were already followed by their doctor, the main **reasons mentioned for not participating** were related to the relationships respondents had with their neighbors: *"Since I already have a family doctor, I can consult with her over the phone whenever I need to. I think maybe I just want to avoid being around certain groups in this building." (R5/F0)*. They also mentioned the *atmosphere* that can be heavy between residents during the CHAP sessions as a barrier to attend: *"I try to go but I am not sure I will keep going. .. even though going means that I can get my blood pressure taken. Q: Are you disappointed? R: Yes, because I want to listen to the talks; I want to hear the expert's health tips and what she has to say." (R2/F4)*. Also, respondents didn't want neighbors to be aware of their health status when taking the pressure: *"Yeah, well you know some of us may feel self-conscious about attending those sessions. Q: In the sense that your neighbors might see you there? R: Yes, that is what I mean." (R7/M0)*

In general, participation in the CHAP was considered like any other activities in the building. People did not participate in any activities including CHAP because they generally prefer to avoid conflicts and retaliation: *"Personally, I often go. And I noticed that it is usually the same ones who tend to participate too. For instance, 90% of people who show up for bingo are regulars. Q: From one of those two gangs? Have you seen there any of the women that you describe as mean-spirited? R: I guess so. To tell you the truth, I am not sure* […] *I went only once* [to bingo] *and I kept to myself; I kept my head down." (R11/F0)*; and especially gossip: *"There is this 53 year-old woman who stopped coming to the sessions. I told her, 'I miss you. I liked seeing you there.' She replied, 'There is too much gossiping and I just can't deal with it.' I think she is right to say that there are many people in this building who like to gossip." (R8/F1).* Finally, another reason that has been mentioned is the presence of cliques and clans in the buildings: *"There are tribalistic groups that have coalesced in this building. They get together downstairs and they say slanderous things* […] *It is so draining; I can't wait to get back up to my place when I hear them get started." (R5/F0)*

Discussion:

The main objective of this study was to evaluate whether relationships and social structures among residents affect participation in the program. Mapping the existing network dynamic, their position and links (structure of power) within the building, is highly relevant to identify internal leaders to support program implementation (9). We were able to identify the barriers of attendance from distance strategies and reasons for not attending that came out from qualitative analysis. We were also able to identify marginal individuals or groups who do not participate, in order to adapt program implementation strategies accordingly (9).

For instance, respondents tended to consider CHAP like any other activity held in the building. Despite the fact that the program might have been beneficial for their health, the conflicting relationship they had with the leaders in the building was the most important reason for them not to attend. People were able to clearly identify leaders (people who are the most central) in a community, from their perception, but using SNA to map the network configuration shows that leaders can have a negative influence on the community. Thus, the peripheral leader wasn't aware of his position in the second building's network and didn't know that he could improve the program implementation by attending the sessions. Another interesting aspect of the relational dynamics of this building was that a person (F1 in Fig. 2), who was not identified as central, had a combined membership of 20 groups in the network, just after the most central person which has 27 but a lot of conflicts. In a network composed of lots of cliques, a person who is able to reach the many through their memberships with many groups is highly valuable as an opinion leader. We also learned (through qualitative interviews) that this person was a friend of both clan chiefs and could reach and maybe bridge both clans' networks.

Our aim was to be able to identify strategies for the future to increase the participation rate. From our analysis, we identify 4 recommendations for future implementation. First, when setting up programs in environments where neighbors live side by side, great importance must be placed on the confidentiality of data. The CHAP had already some measures in place - volunteers were trained in confidentiality issues, tables were as far away as possible, respecting participants privacy when being measured for waist circumference -, but the results indicate that more should be done especially when the blood pressure was taken. Second, people said that they would go if they knew for sure that someone they knew in the building was also planning to attend. Raising awareness among participants of their role as change agents and using community peer-networks to recruit and reach maximum members of the community could be one such strategy (9, 17). Third, encouraging residents to come in pairs can be really useful because it helps overcoming the barriers mentioned previously (fear of rejection). The person accompanied by someone would have less fear of not making a place for themselves among the already formed group. Fourth, in a context of conflicts, if a power dynamic is identified in a building (presence of clans competing for control of activities in a building), intervening through the positive leader may be the most effective way to create change. On the other hand, if there are conflicts and presence of negative leaders, then intervening through bridging individuals would be an effective strategy (10).

Two main limitations of this study can be identified, particularly in relation to the changes that may occur in the network between the beginning and the end of the implementation of the program, but also of the research. An event such as conflicts between leaders or a leader that recently passed away or moved out can considerably influence the dynamics of the network and participation in activities including CHAP. Nevertheless, the interest of this type of micro-society setting is that we were aware of these events in the course of research, because the following interviewees report it. However, because of the high turnover of the residents, the change in the leaderships in the buildings and conflicts that affects the relational dynamics in general, it would be ideal if network data could be collected at several points during the four phases of an implementation process: the needs assessment, program design, implementation, and the program sustainability stage (9). Therefore, program's potential for diffusion in the community can be

estimated and longer-term implementation strategies can be considered (9, 33). Also, replicating the research in different buildings in order to establish a referential typology of relational dynamics could make it possible to counter these limits due to changing relational dynamics.

Conclusion:

As the composition of peoples' networks mediates the benefits of a health program, taking into account neighbors' relational dynamics could contribute in identifying strategies for CHAP to become an ongoing initiative. The objective of the study was to generate a portrait of two buildings' relational dynamics, which represents different cases in terms of participation (high and low), in order to see if relationships can explain these differences. The SNA methodology proposed in this research used sociometric questionnaires and complete network analysis, supplemented by a qualitative questionnaire to understand the building's relational dynamics and its influence on program participation. The quantitative measures of social networks such as mapping the existing network dynamic, position and links within the building, helped to identify positive and negative leaders to inform and support the program implementation. The qualitative results have illustrated how conflicting relationships but also proximity and distance strategies between neighbors can influence the participation in the health promotion programs in social housing The analysis has shown the presence of clans and conflicts, amalgams between the program and other activities of the building, as well as individual and relational factors in order to explain the differences in participation and helped to identify well-known and appreciated leaders in order to accelerate behavior change.

SNA applied to interpersonal relationships could help understanding the influence of interactions on people's participation in a cardiovascular health program and more generally, inform and support innovative health practices and guidelines for creating environments that improve the quality of life of older people.

List Of Abbreviations:

CHAP Cardiovascular Health Awareness Program

CVD Cardiovascular Diseases

RCT Randomized Cluster Trial

SNA Social Network Analysis

BP Blood Pressure

Declarations:

Ethics approval and consent to participate

This study was approved by the **Research Ethics Committee of Centre hospitalier de l'Université de Montréal** (**18.358 under the project 18.120**).

Consent for publication

Not applicable.

Availability of data and materials

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

NDS and JK led the conceptualization and design of the study. NDS and MG lead the coordination of the study. NDS collected, analyzed and interpreted the data (SNA and qualitative). NDS wrote the first draft and all authors critically reviewed it and provided comments to improve the manuscript. All authors read and approved the final manuscript.

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Figures

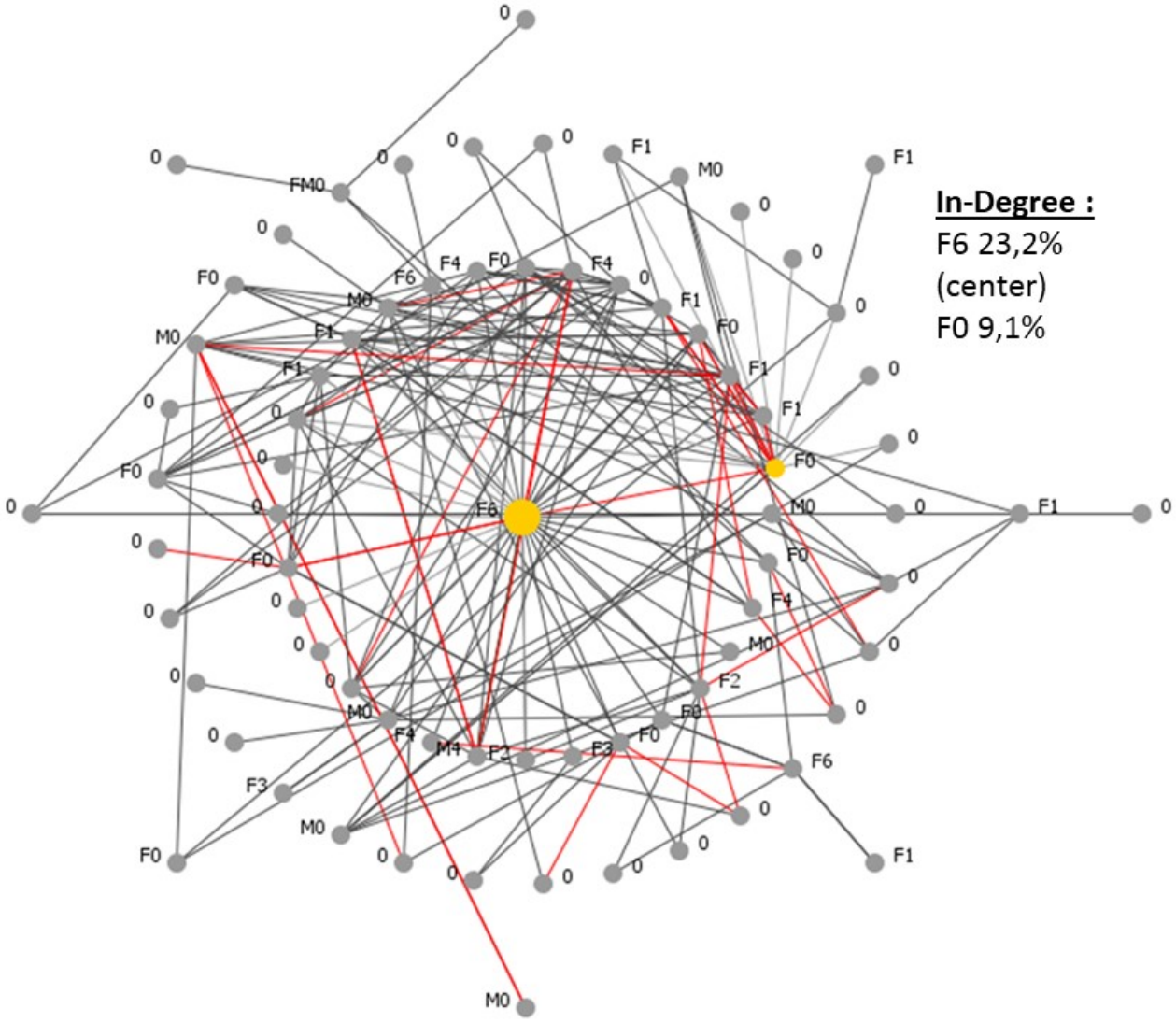

Figure 1

Complete network of building 1 (links and conflicts) Conflict Contact Leaders F = Female M = Male Number = CHAP's participation

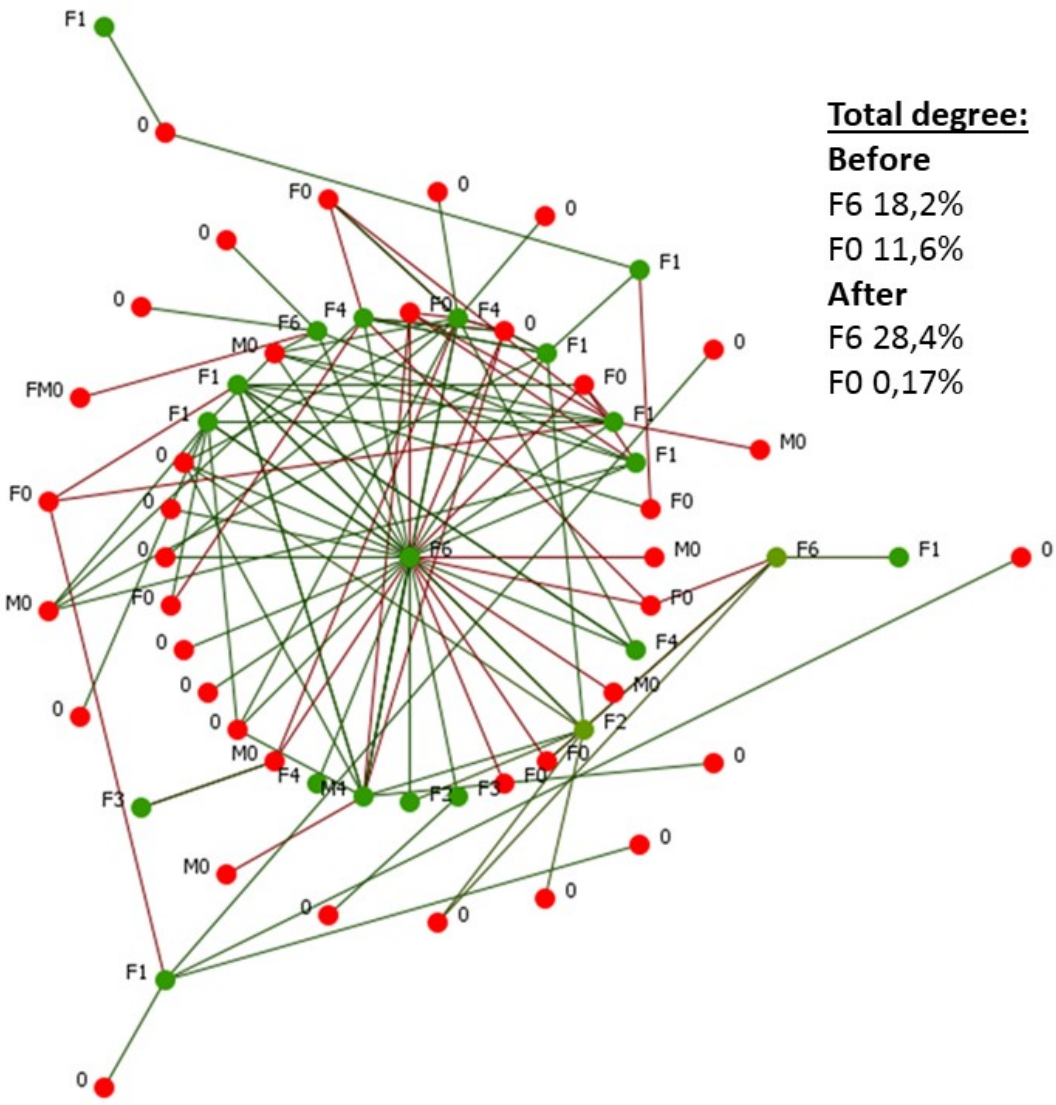

Figure 2

Diffusion potential of building 1 F = Female M = Male CHAP's participation = & Number No participation to CHAP =

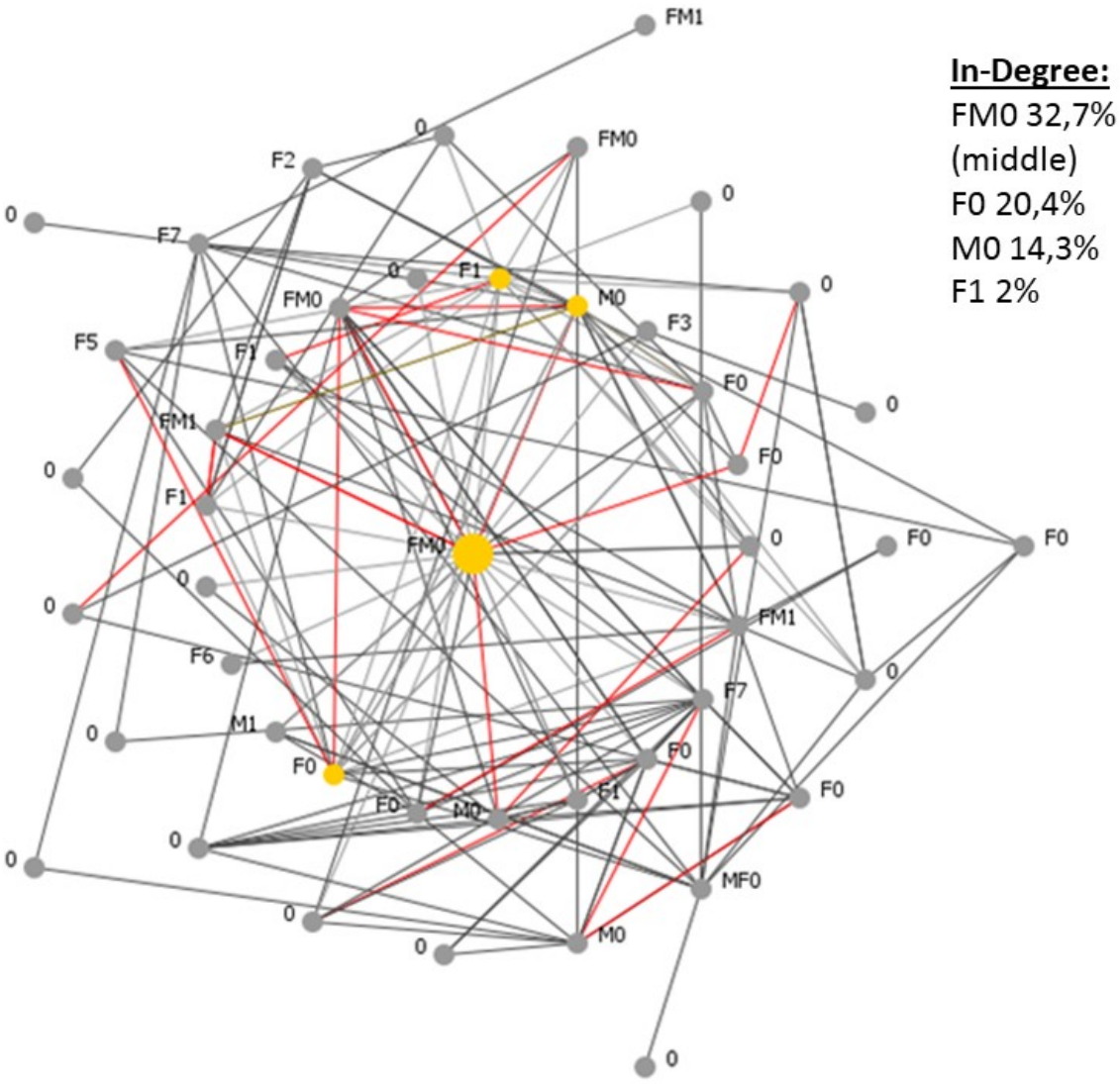

Figure 3

Complete network of building 2 (links and conflicts) Conflict Contact Leaders F = Female M = Male Number = CHAP's participation

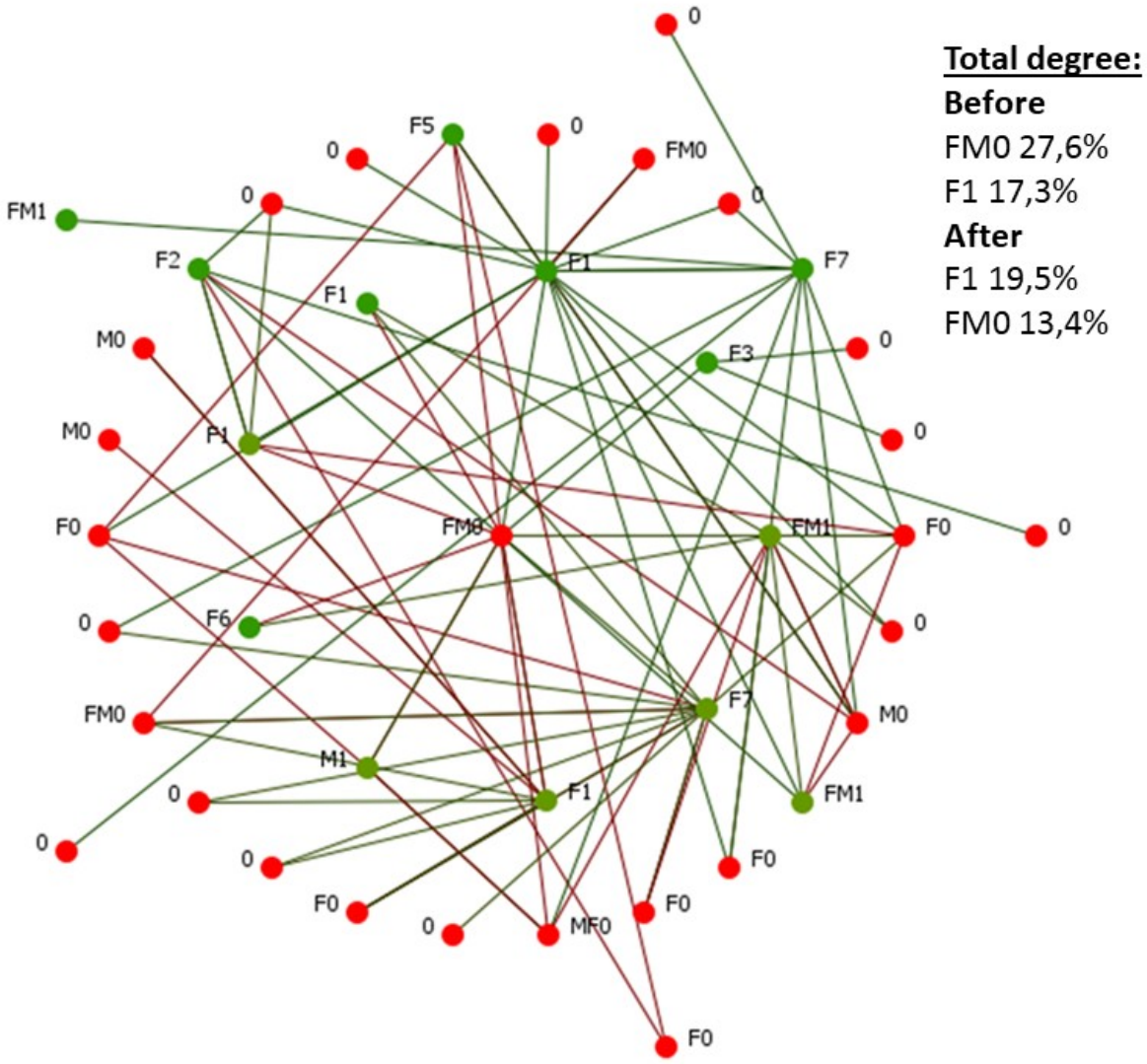

Figure 4

Diffusion potential of building 2 F = Female M = Male CHAP's participation = & Number No participation to CHAP =

Supplementary Files

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- COREQChecklistNDS.docx