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JOURNAL TITLE: Dementia
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AUM CATALOG TITLE: Dementia
ARTICLE TITLE: The feasibility of measuring social networks among older adults in assisted living and dementia special care units
ARTICLE AUTHOR: abbott, K M
VOLUME:
ISSUE:
MONTH: 07
YEAR: 2013
PAGES:
ISSN: 1471-3012
OCLC #:
CROSS REFERENCE ID: [TN:729511][ODYSSEY:130.91.116.120/BIOMED]
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**The feasibility of measuring social networks among older adults in assisted living
and dementia special care units**

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Dementia published online 8 July 2013
DOI: 10.1177/1471301213494524

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The feasibility of measuring social networks among older adults in assisted living and dementia special care units

Dementia
0(0) 1–21

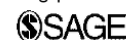
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DOI: 10.1177/1471301213494524

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Abstract

Background: Studies indicate that social integration has a significant influence on physical and mental health. Older adults experience an increased risk of social isolation as their social networks decline with fewer traditional opportunities to add new social relationships. Deaths of similar aged friends, cognitive and functional impairments, and relocating to a nursing home (NH) or assisted-living (AL) facility contribute to difficulties in maintaining one's social network. Due to the paucity of research examining the social networks of people residing in AL and NH, this study was designed to develop and test the feasibility of using a combination of methodological approaches to capture social network data among older adults living in AL and a dementia special care unit NH.

Methods: Social network analysis of both egocentric and sociocentric networks was conducted to visualize the social networks of 15 residents of an AL neighborhood and 12 residents of a dementia special care unit NH and to calculate measures network size, centrality, and reciprocity.

Results: The combined egocentric and sociocentric method was feasible and provided a robust indicator of resident social networks highlighting individuals who were socially integrated as well as isolated.

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Keywords

Assisted living, dementia special care unit, personal networks, social networks, whole networks

Introduction

Chronic illness or disability dramatically affects a person's social interactions and limits their ability to maintain social ties. Studies have shown a decline in the amount of social connectedness among older adults due to factors such as retirement, death of same aged peers, and functional health declines (Cornwell, Laumann, & Schumm, 2008; Cornwell & Waite, 2009). Maintenance of social relationships can also be disrupted by changes in living arrangements from the community to residential long-term care (LTC), such as those provided in assisted living (AL), nursing homes (NHs), or dementia special care units (D-SCU; Field, Walker, & Orrell, 2002). While the transition to LTC makes it more difficult to maintain existing community ties, the LTC setting presents opportunities to form new social ties as other residents and formal care providers become central to daily life. Measures of social network characteristics (e.g. network size, quality, and centrality) have been linked to a variety of mental and physical health outcomes, such as mortality risk, happiness, obesity, and loneliness (Cacioppo, Fowler, & Christakis, 2009; Christakis & Fowler, 2007; Fowler & Christakis, 2008; Holt-Lunstad, Smith, & Layton, 2010). However, our knowledge of the structure of social connections for older adults receiving LTC is limited, particularly with regard to the relationship between the nature and severity of cognitive impairments and the size, composition, and quality of the social network.

It is currently estimated that there are over 36 million people living with dementia worldwide (Alzheimer's Disease International, 2009). This number is expected to increase to 63 million by the year 2030 (Wimo, Winblad, Aguero-Torres, & von Strauss, 2003). Due to the progressive nature of the disease, informal or formal care is needed (Nordberg, von Strauss, Karenholt, Johansson, & Wimo, 2005) often precipitating a move to residential care (Mitchell & Kemp, 2000). Two common residential care options in the United States include AL and NH. In addition to AL and NH care, 20% of US NHs report adding a D-SCU (Wimo & Prince, 2010). D-SCUs have developed to address the unique care needs of individuals with cognitive impairment and provide a separate secured physical space for residents. These units offer specialized programming for residents, as well as higher staffing ratios and a general orientation toward reducing the environmental and functional stressors residents' experience (Gruneir, Lapane, Miller, & Mor, 2008).

There is a growing literature base regarding the importance of social relationships in residential care. One major reason why individuals relocate to AL is to be around other people (Ball et al., 2000). The well-being and quality of life of residents who are not cognitively impaired have been linked to perceived social support, a cohesive environment, social activities, and contact with family (Cummings, 2002; Mitchell & Kemp, 2000). Social relationships with other residents and staff within the AL have been found to be the most important predictors of well-being and life satisfaction among cognitively capable residents (Burge & Street, 2010; Park, 2009; Street, Burge, Quadango, & Barrett, 2007). Facilitators and barriers for developing social relationships in AL include control over the move to AL and external social support (Burge & Street, 2010) ageism and stigma (Dobbs et al., 2008), and perceived support (Litwin, 1998). Interventions to increase social integration in AL have been shown to maintain perceived social support

(Winningham & Pike, 2007). Finally, a recent ethnography of individuals with dementia residing in LTC found that they created small clusters of friendships within their larger social environment termed, nested social groups (Doyle, de Medeiros, & Saunders, 2012). In addition, the authors found that the physical environment could impede or enhance resident movement and potential socialization opportunities and that staff decisions used to maximize task efficiency created impediments to socialization between residents (Doyle *et al.*, 2012).

Some studies have investigated social interactions and friendships among individuals living in D-SCUs. These studies underscore how preconceived notions of staff can affect their ability to accurately report social interactions among residents (de Medeiros, Saunders, Doyle, Mosby, & Van Haitisma, 2012) and how the design of the physical environment and opportunities to engage with other residents facilitated social interactions (Diaz Moore, 1999). Fewer agitated behaviors were observed among cognitively impaired residents who had more frequent social visits by individuals living outside of the D-SCU (Cohen-Mansfield & Marx, 1992; Kutner, Brown, Stavisky, Clark, & Green, 2000). Despite this growing body of literature on social interactions, research measuring the social network characteristics of residents in AL and NH environments remains limited.

One way to collect social network data among older adults receiving LTC is the personal or egocentric approach. The egocentric approach focuses on the ties that specific people have across different groups and often includes the collection of attribute data, such as demographic and psychological variables. This approach uses either a mapping technique to nominate important individuals in concentric circles (McCarty, Molina, Aguilar, & Rota, 2007) or name generating questions to create the list of individuals making up an individual's social network by role or relationship (Marin & Hampton, 2007). Because egocentric networks typically focus on close relationships, it is recognized that this approach is likely to exhibit an undeterminable amount of incompleteness regarding the day-to-day, routine interactions that may influence health outcomes because, for example, interactions with LTC staff and residents may not be included.

Another approach to SNA is the sociocentric (whole network) approach which identifies all the ties containing specified relations in a defined population (Hampton, 2007; Wasserman & Faust, 1994). This approach focuses on measuring the structure of patterns of interactions within a specific population, for example, those residing together. A sociocentric approach is needed to more fully describe the day-to-day interactions among individuals in residential care settings. This approach relies upon a bounded group, such as employees of a company, students in a classroom, or residents of a D-SCU. The bounded group is asked to report only on interactions within that group. For example, students are asked with which of the members of their class they choose to study. However, the utility of the sociocentric approach in the LTC setting is unknown. One advantage of this approach over egocentric studies is that it includes information on the aggregate structure of the local social network (Smith & Christakas, 2007). A limitation of the sociocentric approach is that it cannot capture ties outside of the bounded group.

Typically, only one methodological approach is selected based upon the specific aims of the study. Sometimes a bounded network is not possible to define (e.g. people who influence your health behaviors) or network members outside the bounded group are not considered to be central to the study. For example, if you were studying corporate organizational structures it would not be necessary to obtain information about employee families. The LTC environment presents a unique opportunity to create a gold standard, combining both

the egocentric with the sociocentric approaches, for the most comprehensive measure of social networks. This has the advantage of capturing both close, supportive relationships that extend beyond LTC, and everyday interactions within LTC. Studies with both assessments are needed to provide a more complete understanding of social network characteristics that have the potential to influence health in the LTC population.

This study was designed to develop and pilot test a combination of methodological approaches to capturing social network data among older adults living in an AL and D-SCU. Guided by the literature and best practices in measurement of social networks, we adapted existing approaches already used by our team, both egocentric and sociocentric, to include strategies that specifically address the complexities of these populations. This enhanced and multi-faceted method of capturing data is guided by an ecological perspective on the social environment (McLeroy, Bibearu, Steckler, & Glanz, 1988). We consider a range of spheres of influence, from the most proximal network partners, including friends and family, to the more distal levels of community and society, and we examine how they interact and influence each other and ultimately the individual at the system's core. The aims of this study are (1) to describe the feasibility of the egocentric and sociocentric approaches to measuring social networks for residents in one AL neighborhood and a D-SCU; (2) to explore the value of integrating the egocentric and sociocentric approaches; and (3) to describe the level of social integration among residents.

Methods

Setting

This study was conducted in an AL and D-SCU of a 501(c)(3) not-for-profit LTC organization providing a continuum of aging services in the Eastern United States. Services not studied include the 61-bed skilled nursing facility and the adult day health services (licensed capacity of 60 clients per day). The University of Pennsylvania Office of Regulatory Affairs reviewed and approved this study, and the administration of the LTC organization was intimately involved with each step of planning and implementation.

The AL has 60 apartments (licensed capacity of 80 residents) with five defined neighborhoods that house 12–16 residents each. One neighborhood was selected by the AL Director to participate in the study because it had the greatest number of residents at the time of data collection. The organization's NH has 61 rooms and one 12-room D-SCU. This specialty unit was selected by the researchers to test the feasibility of using our integrated approach to measuring social networks among individuals with cognitive impairment. Services available to all AL and D-SCU residents include: 24-hour nursing and personal care, meals, laundry and linen service, daily housekeeping services, spiritual and pastoral care, recreational and educational activities, social services, health and wellness services, and transportation.

Sample recruitment

There were no age, physical, or mental health exclusion criteria, and all residents in the AL neighborhood selected and D-SCU were English speakers. The social workers in the AL and D-SCU assessed the cognitive status of all eligible residents three weeks prior to data collection via the Mini-Mental State Examination (MMSE). The widely used MMSE is an assessment tool that measures orientation to time and place, recall ability, short-term

memory, and arithmetic ability in older people. Due to the need to protect vulnerable human subjects (i.e. individuals with cognitive impairment) and for the purposes of discussing informed consent with a legally authorized representative (LAR), we considered residents with a MMSE score of 23 or higher to be cognitively capable and residents with a MMSE score of 22 or lower to be cognitively impaired (Crum, Anthony, Bassett, & Folstein, 1993). This cut point was also deemed appropriate by the Institutional Review Board that reviewed the study. A member of the organization contacted LARs of individuals with scores of 22 or lower to explain the study and request consent for the resident to participate in the study. Upon receiving LAR consent, we approached each resident for their assent. Residents with MMSE scores of 23 or higher who were interested completed informed consent documents without their LAR being contacted.

For the AL, one in-person group meeting was held with all residents of the identified neighborhood for the study team to describe the study and provide an informational handout to potential participants. Individual meetings were then scheduled at a time convenient to residents to review the study, answer any questions, and discuss participation. Potential participants were given time to ask questions, consider their decision, and confer with a family member or friend, if needed. The Dementia Care Coordinator recommended that we not hold a group meeting with the D-SCU residents as it would be potentially confusing and could provoke anxiety among the residents.

Data collection procedures

Data collection about resident social interactions involved interviews with participating residents. The interview guide to collect both egocentric and sociocentric data was developed using previously tested items and approaches used by the investigative team (Abbott, Stoller, & Rose, 2007; Hampton, 2011; Hampton & Wellman, 2003; Helleringer, Kohler, Chimbi, Chatonda, & Mkandawire, 2009). Our goal was to develop an instrument and strategy that measured both egocentric and sociocentric social network information, from the residents' perspective, for use in larger longitudinal studies with both cognitively capable and cognitively impaired individuals.

Realizing the difficulties residents with cognitive impairment can have with recall, we decided to use photographs to aid with the data collection process (Bourgeois, 1990, 1993). Photographs of residents and staff were presented to participating residents who could point to pictures to nominate individuals with whom they interacted. Residents from both the D-SCU and AL who declined to participate in interviews were asked for permission to allow the study team to either take their photo or use their existing file photo as part of the study's data collection process to aid memory recall. In the AL, the project's interviewer took photos of residents who provided consented, and in the D-SCU the Dementia Care Coordinator took photos of residents who provided consent.

AL residents. For residents in AL, two separate interviews were scheduled within a three-week period. Scheduling with the residents was facilitated by an administrative assistant for the organization. The first 60-min interview included self-reported measures of health (not reported in this manuscript), a description of demographics, and the use of the egocentric approach to measuring social networks, which used seven name-generating questions (Table 1). The name generator questions were developed based upon existing literature and our previous work with frail older adults (Abbott et al., 2007; Abbott, Prvu

Bettger, Hanlon, & Hirschman, 2012). We incorporated the name generator question ‘with whom do you discuss important matters’ that has been used in the General Social Survey since 1985 and has been found to be a reliable measure of American core discussion networks (Marsden, 1987). We also considered major domains relevant to interactions of older adults receiving LTC, such as instrumental assistance, emotional support, reciprocity, and health discussions. The goal was to enumerate a list of close, supportive ties that could include individuals both within and external to LTC. Name generator questions (see Table 1) were read to participants and the first name and last initial of the person they nominated were recorded. Additional data were obtained regarding each of the individuals nominated, such as relation, age, proximity, frequency of contact, and importance of relationship, but not reported in this paper. The use of photos to aid in name recall was not feasible for the egocentric portion of the interview because we were unable to know the full range of individuals who potentially could be nominated. Because of this, we also did not limit the number of people who could be mentioned in response to the egocentric questions.

The second 60-min interview used a sociocentric approach to measuring social networks. To be able to compare reports of interactions within the same group of residents and validate responses given by multiple people, we used the same reference period for all participants and asked residents to think about their social interactions in the past week. This meant that all the sociocentric interviews in the AL had to be completed during the same week in order for the participating residents to reference the same past week. Each resident was presented with pictures of all the consenting residents in their neighborhood/community and asked three questions; pick up to five people with whom you spent the most time in the past week, who provided help to you, and who you provided help to (Table 1). Switching to staff photos, residents were asked the same three questions about employees. Because we knew that all the residents knew one another, we limited the number of nominations to five people to prevent respondent fatigue. We felt having the top five people with whom they spent the most time with recently would be sufficient to demonstrate the feasibility of this study. The interviewer used a network roster to document responses. Data obtained using the sociocentric approach are considered a relational data set because each respondent is able to nominate others from the same set of individuals. With this relational data, patterns of relationships among a defined group of individuals can be examined, and measures of network structure using social network analysis can be calculated. Respondent fatigue was measured at the start and completion of each interview. The interviewer asked the resident to indicate on scale of 1 to 10, ‘how tired, worn out, or exhausted’ he or she was that day. A visual of the scale was also provided illustrating 10 was very tired, worn out, or exhausted, and a score of 1 was not at all tired.

D-SCU residents. Residents in the D-SCU completed one truncated 30-min interview that addressed demographics, quality of life, health status, egocentric, and sociocentric networks. We modified our protocol for the D-SCU residents slightly based upon lessons learned in the AL. We did not ask D-SCU residents to report on interactions in the past week. Instead, residents were asked who they recently spent time with. The egocentric component of the interview consisted of two name-generating questions (see Table 1) instead of the seven asked of AL residents. We asked with whom do you discuss important matters and with whom do you discuss your health because these two items generated the most nominations among the AL residents. The sociocentric component of the interview had the residents look at the pictures of other residents and answer five

Table 1. Egocentric and sociocentric interview questions for residents.

	Egocentric	Sociocentric
Assisted living residents	(1) In the past six months, with whom did you discuss important matters? (2) Who currently comes to you to discuss important matters? (3) Who currently helps with shopping, taking meds, handling money (instrumental activities of daily living)? (4) Who currently helps with self-care activities (activities of daily living)? (5) Whom do you currently talk to about what the doctor, nurse, or other health care professional has told you? (6) Whom did you text, e-mail, or communicate with using a computer in the last week? (7) Whom did you call on the phone in the last week?	(1) Pick up to five people with whom you spent the most time in the past week (starting with the previous Monday); (2) Pick up to five people <i>who provided help to you</i> in the past week; and (3) Pick up to five people <i>you provided help to</i> in the past week.
D-SCU residents	(1) With whom did you discuss important matters? (2) With whom do you talk to about your health or can you really count on when you have physical or emotional problems?	(1) Point to the people with whom you spent the most time with recently; (2) Point to people you have helped by listening to their problems; (3) Point to the people you have helped by doing something for them, such as get something from their room; (4) Point to the people who have helped you by listening to your problems; and, (5) Point to the people who have helped you with something in your room.

questions regarding who they spent time with, listened to problems, helped with something, who helped them, and who listened to them. To learn about interactions with employees, residents were shown photos of consenting staff members and asked to (1) pick the people who provided help to you; (2) report the type of help received; and (3) rate how helpful the person was (not very helpful, somewhat helpful, very helpful). We limited the number of nominations to five people to prevent respondent fatigue and discuss the ramifications of this decision in the limitations.

Measurement and analyses

An integrated approach to measuring social networks among older adults in LTC has not been conducted previously. In this study, we included measures of feasibility; three types of

social network measures—network size, degree centrality, and reciprocity—and present sociograms as visual representations of the networks.

Feasibility. We included several measures of feasibility including study participation, interview burden by length of the interview (egocentric versus sociocentric, or combined for those in the D-SCU) and the change in residents' reports of fatigue on a scale of 1–10, by the ability to nominate network partners (identifying an individual by name), and by whether these varied by cognitive status or by setting.

Sociograms. The D-SCU residents' social networks are visually described with sociograms to illustrate how the data from each approach differ. NodeXL was used to design the network visualization and to calculate social network measures using social network analysis (see Hansen, Schneiderman, & Smith, 2011 for more details on creating the relational data set and sociograms). The sociograms of the AL residents are presented elsewhere (Abbott, Prvu Bettger, Hampton, & Kohler, 2012).

Network size. Both the egocentric and sociocentric approaches can be used to measure network size. Network size is an indicator of the amount of social connectedness and has been linked to greater access to social support. Older adults with larger networks receive more timely informal support in times of illness and so experience a slower decline in health over time (Choi & Wodarski, 1996). We describe network size as a count of network partners nominated by each resident and by each approach.

Degree centrality. This measure is calculated using sociocentric data only. Degree centrality is a measure of individual or local network activity. Centrality is a core concept in social network analysis because it can answer critical questions about which individuals occupy positions of power, prestige, and visibility. Highly central individuals can be influential in the spread of diseases, ideas, or behaviors. Three components of degree centrality are reported and calculated as follows: the total number of social ties to and from a resident (degree), the number of ties the resident mentioned (out degree), and the number of nominations the resident receives from others (in degree; Freeman, 1978). A resident who has a high degree of centrality is connected to many people in the group. In degree can be useful for identifying opinion leaders or popularity and out degree values can be used as a measure of network size. This measure is relevant to the goals of the study through the potential use of identifying individuals who are more isolated with low centrality scores.

Reciprocity. We explored reciprocity by calculating the percentage of mutually reported resident ties using the sociocentric approach. This approach allows for analyses of the relationship in both directions, as residents nominate individuals in their network and are nominated by others. Reciprocity and trust in groups have been found to be strongly predictive of morbidity and mortality in community-dwelling adults. We calculated reciprocity as the proportion of mutually reported ties out of all reported ties. This measure can also be viewed as a measure of the veracity of resident nominations. In other words, if Carol nominates Don and Don nominates Carol, we can be fairly certain there is a relationship present and that the nomination was not due to chance.

Results

Feasibility

Study participation. The AL neighborhood selected for the study had 15 residents. Ten residents agreed to be interviewed and provided informed consent. Of the resident participants who consented, the mean age was 86 years (standard deviation (*SD*) 3.4, range 82–92 years). Half were female, and the mean years of education completed was 15 (*SD* 1.9, range 12–17 years). The mean MMSE score of participating residents was 25.8 (*SD* 5.4, range 16–30). All residents were non-Hispanic, married, retired, and white, with an average of three living adult children. The average length of time they had lived in the AL facility (ALF) was 27 months (*SD* 16, range 11–46 months). Of the five residents who did not participate, three declined. One had fallen the day before and was not feeling well enough to participate and the other two were not interested in the study. The remaining two residents could not be contacted because one was employed outside of the AL 4 days a week, and the second was living in a summer house at the time of data collection. Four of the residents who did not participate were widowed and one was married. Four were retired females, and one was an employed male. The mean age and MMSE scores were similar to the residents who consented to participate (mean age 89 years, *SD* 2.3, range 85–91; mean MMSE 26.2, *SD* 5.3, range 17–30). The average length of time the non-participating residents had lived in the ALF was 36 months (*SD* 18.4, range 3–46 months). Two of these five residents did grant permission for their photos to be used in the study, and thus they were nominated by others as network partners, even though they did not participate in the sociocentric interview themselves.

The D-SCU has 12 residents. MMSE scores of all but one resident were <22 and so family were contacted for 11 of the residents to participate. Ten resident family members agreed to allow their relative to be interviewed and provided informed consent. Of the participants who provided assent or consent, the mean age was 87 years (*SD* 4.6, range 82–96 years), mean years of education completed was 15 (*SD* 2.7, range 12–20 years), 80% were female and the mean MMSE score was 17.2 (*SD* 4.2, range 11–25). Fifty percent were widowed, 40% married, and 10% divorced. All participants were non-Hispanic white. The average length of time they had lived in the D-SCU was 21 months (*SD* 25, range 2–80 months). Family for two residents did not wish for their relative to participate in the study or have their relative's photos used to be nominated by others. These residents were both males with MMSE scores of 11 and 18 and were 89 and 95 years old. The mean age was 92 years (*SD* 4.2, range 89–95 years). One resident had just moved to the D-SCU, and the other resident had lived in the D-SCU for 58 months.

Interview burden. Interviews were on average completed within the allotted time. Sixty minutes were allotted for the first interview (demographics, health status, and egocentric interview) with AL residents. Interview length ranged from 30 to 63 min with a mean of 45 min. Sociocentric interviews with AL residents were scheduled for 60 min and ranged from 30 to 80 min, with a mean of 49 min. We allotted 30 min for the combined resident interview for D-SCU residents, and the actual time ranged from 20 to 45 min (mean = 30 min).

Respondent fatigue was measured by asking residents at the start and completion of the interview to rate on a scale of 1–10, how tired, worn out, or exhausted they were. The burden associated with the interviews was minimal, with only one person indicating a one-point

increase in fatigue upon completion of the interview. AL residents participated in two separate interviews. Reports of fatigue for the first interview did not change for nine individuals and decreased by five points for one individual. Similarly, for the second interview, reports of fatigue remained the same for eight residents and decreased by one point for two residents. For residents in the D-SCU who completed one interview, eight residents reported no change in fatigue, one reported a one-point increase in fatigue, and one did not complete the interview due to hearing difficulties.

Network size

Network size, the number of individuals nominated by each resident, is presented by approach; type of nominee (resident, staff, family/friend) and MMSE score of the resident in Table 2. On average, six different individuals were nominated using the egocentric approach (range 0–17), and seven different individuals were nominated using the sociocentric approach (range 0–14). The egocentric approach provided us with ties that were typically family members living outside the residential setting (not possible with the sociocentric approach). Residents with higher MMSE scores typically nominated more individuals than residents with lower MMSE scores. With one exception, the person who

Table 2. Nominations of social network members using the egocentric and sociocentric approaches.

ID	Setting	MMSE score	Egocentric approach nominations			Sociocentric approach nominations		Network size	
			Residents	Family, friends	Staff	Residents	Staff	Overlap in approaches	Total unique nominations
Donna	AL	30	1	7	0	4	5	1	16
Mildred	AL	30	0	6	0	7	6	0	19
Patty	AL	30	2	8	0	7	7	0	24
Sam	AL	30	4	13	0	7	7	4	27
Carol	AL	27	0	6	8	6	5	5	20
Don	AL	27	7	8	0	5	7	2	25
Everett	AL	26	2	4	4	4	2	4	12
Larry	AL	26	1	4	5	4	5	2	17
Sue	D-SCU	25	0	1	0	0	1	0	2
Joan	D-SCU	22	0	3	0	3	5	0	11
Ester	D-SCU	22	0	1	0	2	3	0	6
Cindy	D-SCU	17	0	2	0	3	2	0	7
Bernie	AL	16	1	3	0	4	3	1	10
Gert	AL	16	1	3	5	5	5	3	16
Pete	D-SCU	17	0	1	0	0	5	0	6
Alexis	D-SCU	17	0	3	0	2	0	0	5
Laura ^a	D-SCU	16	Missing			0	0		0
Andrea	D-SCU	16	0	3	0	0	0	0	3
Joe	D-SCU	14	0	5	0	4	2	0	11
Lisa	D-SCU	11	0	1	0	2	2	0	5

^aWe stopped the interview before asking the egocentric approach questions due to resident hearing impairment.

had the highest MMSE score in the D-SCU did not nominate any residents and was not nominated by any residents.

There is a broad range in network size across our sample (range 2–27). Three D-SCU residents mentioned spouses who were deceased and two mentioned mothers and fathers who were also deceased (confirmed by staff and family). Staff and other residents were rarely mentioned during the egocentric approach. In the AL, the most frequently mentioned staff members were the first and second shift concierge. In the D-SCU, the nurse (RN) was nominated by six residents, and the recreation coordinator was nominated by five. It is only through the sociocentric approach using photos that we were able to collect information about the local network of the AL and D-SCU. When asked specifically about staff and other residents multiple nominations were made. In addition, there was some overlap between approaches with 42% mentioning the same individual(s) in both approaches, which included spouses, staff members, and other residents living in the neighborhood. The most common interactions were face-to-face or via telephone. Only one person in the AL reported communication via e-mail and no one reported communication via text messaging or letter.

Sociograms

Both types of data can be used to create a visualization or sociogram. These visualizations are helpful in identifying the overall structure of relationships as well as aspects of individuals. We first present the sociogram created using egocentric data from the D-SCU (Figure 1), which shows how few individuals each resident nominated in response to asking with whom they discuss important matters and health concerns. It also illustrates how each resident nominated different individuals, such as a spouse or adult child (shown as spheres).

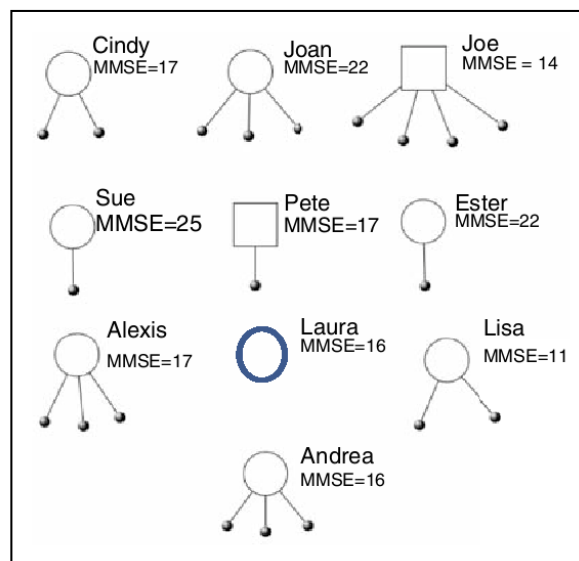


Figure 1. Visualization of egocentric data from residents in the D-SCU. Circles = women; squares = men; spheres = unique individuals nominated.

In comparison, Figure 2 is the sociogram of D-SCU resident to resident nominations, which can only be created using the sociocentric approach. Sociocentric data depiction shows structural aspects of a defined network that can highlight many aspects such as isolates and highly central individuals, which is not possible using an egocentric approach. In Figure 2, there are people who are central to the network (Cindy, Joe), others on the periphery (Pete, Andrea), and one person completely isolated (Sue). Sue is an isolate who did not nominate any residents and was not nominated by any other resident. Joe acts as a critical tie to Pete and Andrea because if Joe is removed from the graph then Pete and Andrea become isolates.

Degree centrality

We calculated individual centrality measures using the sociocentric data from resident nominations (Table 3). Overall, Patty and Sam have the highest degree centrality, connecting them to the most residents in the AL, while Cindy and Joe have the highest degree centrality in the D-SCU. Popular residents, identified by the number of in-degree nominations, included Patty in the AL and three residents shared the most in-degree nominations in the D-SCU (Cindy, Joe, and Lisa). Felicia was unable to speak due to a health condition. However, given the difficulty she has with communication, she was still nominated by four people, including her husband (Sam). Gladys remains isolated, being nominated only by one person, even though all participants had the opportunity to

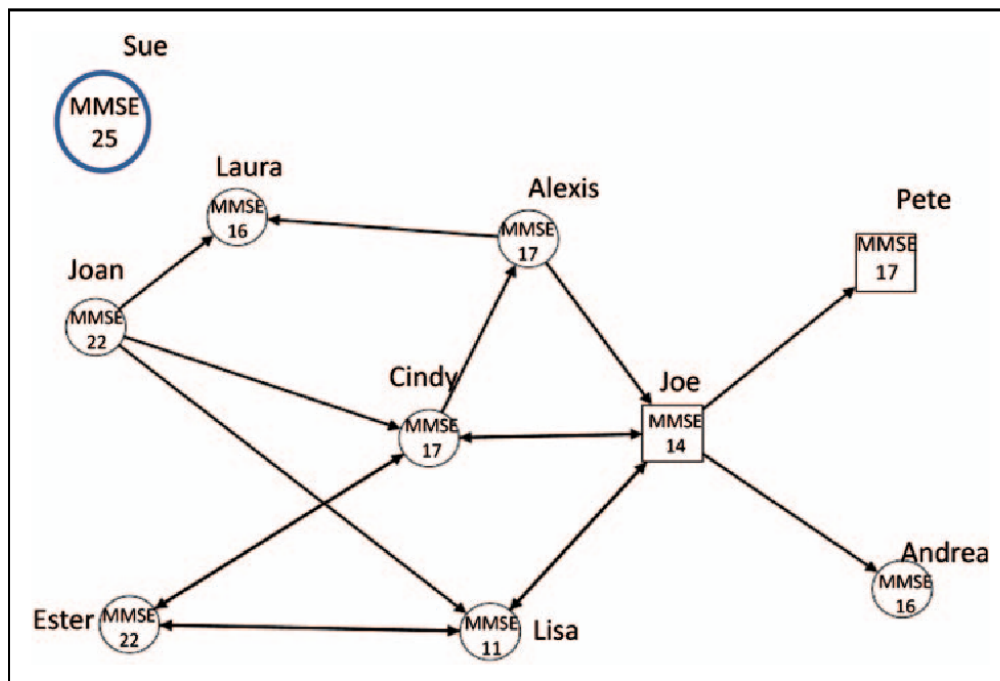


Figure 2. Visualization of sociocentric data from residents in the D-SCU. Circles = women; squares = men; single-headed arrows = non-reciprocated tie; double-headed arrows = mutually reported ties.

nominate her. Sue had the highest MMSE score in the D-SCU but did not nominate any other residents and had the lowest centrality at zero.

Reciprocity

We examine reciprocity through the percentage of mutually reported ties. This is of interest because, if A nominates B and B nominates A, we have verification that a relationship exists, which can be used as an indicator of the strength of the tie between individuals. In the AL, the percentage of mutually reported ties ranged from 20% to 75%, with an average of 55% (see Table 3). In the D-SCU, four individuals had some degree of mutually reported ties with a range from 40% to 100%, with the majority of residents having no reciprocated ties. Surprisingly, the resident (Lisa) with the lowest MMSE score had the second-highest percentage of mutually reported ties (67%).

Discussion

The main purpose of this study was to develop and explore the feasibility of using a combined egocentric and sociocentric approach to collecting social network data in one

Table 3. Percentage of mutually reported ties and degree centrality measures.

Resident	ID	% Mutually reported ties	Degree	In-degree	Out-degree
Assisted living					
Carol	27	67	6	4	6
Bernie	16	40	5	2	5
Don	27	57	7	6	5
Donna	30	60	5	4	4
Mildred	30	67	6	5	5
Everett	26	60	5	4	4
Patty	30	67	9	9	6
Sam	30	36	11	8	7
Larry	26	75	4	3	4
Gert	16	20	5	1	5
Gladys		–	1	1	0
Felicia		–	4	4	0
Dementia special care unit					
Cindy	17	50	4	3	3
Joan	22	0	3	0	3
Joe	14	40	5	3	4
Sue	25	0	0	0	0
Pete	17	0	1	1	0
Ester	22	100	2	2	2
Alexis	17	0	3	1	2
Laura	16	0	2	2	0
Lisa	11	67	3	3	2
Andrea	16	0	1	1	0

AL neighborhood and a D-SCU. Where the egocentric approach focuses on a recall of individuals from a variety of social settings, the sociocentric approach offers a view of the patterns of relationships among a group that is pre-defined (Wasserman & Faust, 1994). In combining approaches, we were able to uncover both individual-level data (e.g. available social support) and measures of group structure (e.g. centrality). This study lays the groundwork for improving the measurement and, therefore, the understanding of social networks among older adults who live in AL and D-SCU. It has the advantage of a methodology for identifying sources of support provided by people who are external to the facility and sources of support that are provided internally. It is evident that, had we used only a single approach – either egocentric or sociocentric – our understanding of the extent of social relationships and support provided would have been incomplete. For example, residents were not providing instrumental assistance to one another, but they were relying upon people external to the community. However, residents did report giving and receiving emotional support from other residents in the form of listening, expressing concern, and offering sympathy. Analyzing social networks at this level of detail was possible only by combining approaches and demonstrates how each approach was sensitive to capturing different types of support.

It was feasible to enroll the majority of residents in both the AL and D-SCU and obtain permission to use photos from those who declined to participate. It was difficult for residents in the D-SCU to recall names of individuals they discuss important matters and health matters with. The data gathered via the egocentric approach from residents in the D-SCU were not always accurate, as residents mentioned individuals who were deceased, as later determined through interviews with family and staff. We can interpret this as a validity issue, lending support to including other perspectives (observations, staff, or family) as well as conducting sociocentric approaches. There are no similar concerns over validity with the sociocentric approach, we had a complete roster of the possible individuals that could be nominated. A second possible interpretation has to do with the perception of support. Some studies have shown that the perception of support may be more important than the receipt of support (Dunkel-Schetter & Bennett, 1990; Wethington & Kessler, 1986). Are the memories of individuals with cognitive impairment providing support? This reflection is a new theoretical idea influencing how we conceptualize companionship in LTC settings. For the most part, employees do not talk about deceased individuals for fear of upsetting residents with cognitive impairment. While this may be appropriate for some residents, discussions that deal with residents' memories of supportive others, even if they are now deceased, may offer comfort that improves overall well-being. The role of dormant or deceased ties is under explored in the network literature and clinical practice.

We hypothesized that those with lower MMSE scores would not mention as many people in their network due to recall difficulties. Therefore, we used photos to aid in the selection of individuals. The use of photos to assist residents with sociocentric nominations was helpful for some residents. However, the feasibility of this approach in larger studies is unknown. Ways of grouping photos, such as 15 photos per AL neighborhood and then having residents review each group of 15 separately, may be one way to approach larger samples. Similarly, grouping staff photos by job type (e.g. certified nursing assistant (CNA), housekeeping, dining) would be a way of managing multiple photographs from a large LTC organization.

Selection bias in participation of social network studies is of great concern, due to the risk of missing key central actors and isolates. We found that widowed individuals in AL did not participate fully in this pilot study. Widowed individuals did not differ by cognitive status

from those who participated, but we are unable to assess whether they differed on other health or personality measures. Widowed individuals may have less social support and, therefore, be less likely to participate in a study of social networks, leading us to underreport socially isolated individuals. Future studies should consider holding separate information session regarding the study that are targeted to widows and widowers, which may help increase the involvement of this group.

Sociocentric results from the D-SCU showed far fewer reported ties and mutually reported ties than in AL. Some D-SCU residents were able to nominate other residents and some were unable to do so. Hearing impairments combined with cognitive impairment made the interviews more difficult. Staff members reported that they tried to make sure residents wore their hearing aids if they owned them. We were able to identify individuals who were central to their neighborhoods, who can be viewed as informal 'neighborhood leaders.' This is a valuable position to hold because central individuals are likely to serve as channels through which information passes, and they have the potential to influence others in the environment. Staff members may call upon central individuals to acclimate new residents since they would have many connections within the organization. Measures of centrality highlight residents who are more or less socially integrated. We did not explore whether individuals with lower MMSE scores were being socially ostracized, or if they were not nominated because of their inability to reciprocate (or both).

We encountered a few complications in conducting this pilot study. Initially, our goal was to be able to create the same reference period for all respondents to consider when nominating ties. This would allow us to check the accuracy of responses with organizational activity lists and other respondent nominations. Therefore, we attempted to interview all the AL respondents during one week (Monday–Friday) so that the period of recall "in the last week" was the same for all AL respondents. We were unsuccessful in adhering to this aspect of our protocol. Even though interviews were scheduled in advance, a number of last-minute health concerns emerged, which necessitated rescheduling. Two residents were unavailable due to doctor and hospital visits that were needed for new health diagnoses. We were able to successfully reschedule one individual during the intensive week, but we were unable to complete the interview with the other respondent, and her interview was completed the following Tuesday. Aside from resident issues, attempting to complete so many interviews during one week was difficult for the AL staff and for the study research assistant. Time commitments needed to schedule and rescheduling resident interviews by the AL staff were very burdensome. Therefore, we dropped this aspect of our protocol and changed the questionnaire wording to 'who have you spent time with recently.'

Organization support was crucial to the success of this pilot study and amounted to approximately 15 hr of support from AL staff and 16 hr from D-SCU staff. Staff time was needed to schedule resident and staff meetings where we introduced the study. In addition, staff assisted by scheduling interviews and taking photos (not including obtaining MMSE scores). Study funds in the amount of 2,000 were divided equally to the AL and D-SCU for their participation.

Limitations

The small size of this pilot study is a major limitation of this study. However, we were able to assess the feasibility of using a combined approach to studying social networks in two LTC settings. We chose the name generating questions based upon standard name

generating questions used in most studies of egocentric networks, however, we focused on the areas we felt were most pertinent to the residential environment that would capture interactions both within and external to the residential environment. Had we asked more questions we may have uncovered more unique individuals, but this also would have increased respondent burden. Similarly, we limited the number of sociocentric nominations to five. This is a common procedure used in most studies of social networks, but it does limit the scope of the actual social network (Marin & Hampton, 2007). In addition, some residents in our bounded group declined to participate. There are limitations to SNA when individual data are missing (Borgatti, Carley, & Krackhardt, 2006; Gueorgi, 2006). While, partial data can be obtained if individuals who decline are nominated by other participants, additional work remains to understand the ramifications of selection bias among studies of social integration. We truncated the interview for residents in the D-SCU because of concerns that the longer interview would be too difficult and distressing. While we assessed the veracity of resident's nominations via mutually reported ties, future studies may wish to include an observational component to assess veracity.

Another limitation included the use of the MMSE for the purposes of describing cognitive status. This was the assessment provided to us by the organization, who expressed concerns about having us include another measure of cognitive status to the interview protocol so soon after the MMSE was administered by the social worker. Therefore, we present the MMSE scores in tables, but are not categorizing residents as cognitively capable or cognitively impaired. Future studies should include more sensitive measures of cognitive status.

This study sets the stage for larger longitudinal studies, which will allow for entire communities to be studied over time. Having responses from a complete community would allow for a fuller description of the social relationships within the AL and D-SCU communities. Identification of individuals who perform bridging functions between neighborhoods, as well as those who are central to the whole community, would provide important insight into the social integration of the community. By understanding the social interactions in residential LTC, we can lay a foundation for exploring the effects of social integration and health in these settings.

Next steps

We are actively pursuing three major directions for future research. First, we hope to scale up this research to include all residents in an AL, not just those in a single neighborhood, and we have completed longitudinal follow-up interviews. In doing so, we need to consider the effects of proximal ties to network characteristics and health. Do daily interactions with other residents and staff members have a greater influence on health than the very important relationships with family, which are typically external to the AL or D-SCU? In the general population, the relationships we have with close friends and family members, who are geographically nearby, are most important to health. Is there a different pattern in AL and D-SCU environments where those who are geographically proximate (staff, residents), but may not be as close or important affect health outcomes? Are there protective health benefits to having a narrow set of supportive ties (staff and other residents) within AL or D-SCU? And ultimately, does the type of network have a relationship to health (Litwin, 2003)? We have also added a loneliness scale to the interview in order to assess if there are people who do not feel lonely despite few social interactions as well as people who may still feel lonely despite many social interactions. The quality of the interactions with neighbors

and staff need to be explored, as well, because they may be more important to health outcomes than the quantity of interactions (Antonucci, 2001). Finally, how would we begin to assess the quality of interactions among D-SCU residents? Understanding which network characteristics (size, quality, and centrality) are connected to health in AL and D-SCU residents would be an important contribution.

Both individual- and neighborhood-level data have been shown to affect health in the general population (Sampson, Morenoff, & Gannon-Rowley, 2002), but how do these findings translate to residential environments where the typical neighborhood needs are different? For example, AL residents are not reaching out to social ties to find employment, nor are they concerned about the quality of the local school district. In residential care settings, personal care, housekeeping, structured activities, meals, and transportation to health services are provided. When these primary motivations for social interactions are altered or removed, the effects on the development and maintenance of social networks are not clear. More research is needed to uncover what types of support networks residents are providing to one another. Residents may be borrowing small items, complaining about the LTC organization, or providing some health monitoring. Further studies are needed to investigate how both egocentric and sociocentric aspects of social networks affect the health of residents.

Second, we seek to include longitudinal follow-ups to examine the change over time in health and network characteristics in order to begin to disentangle the relationships between network characteristics and health. A third major future direction is the use of technology, such as radio frequency identification badges to capture social interaction data and use of electronic medical records to obtain health data such as number and severity of chronic conditions.

Measuring social integration in AL and D-SCU is challenging, however, this study demonstrates the feasibility of using a combined egocentric and sociocentric methodological approach. The majority of residents participated in interviews and the use of photos to aid in recall was useful. We were able to calculate social network characteristics showing the potential for larger longitudinal studies to explore the bi-directional influence of social networks and health for a group of people who are at increased risk of social isolation and illness.

Acknowledgments

The authors wish to thank the older adults participated in this study as well as the administrators and staff from the assisted living facility who provided guidance throughout the study period.

Funding

We gratefully acknowledge funding support from the ALF in which this study is based as well as funding from the University of Pennsylvania Institute on Aging.

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