Social networks and self-rated health in two French-speaking Canadian community dwelling populations over 65

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Abstract

The objective was to evaluate the associations between older persons' health status and their social integration and social networks (family, children, friends and community), in two French-speaking, Canadian community dwelling populations aged 65 years and over, using the conceptual framework proposed by Berkman and Thomas. Data were taken from two 1995 surveys conducted in the city of Moncton ($n = 1518$) and the Montreal neighbourhood of Hochelaga-Maisonneuve ($n = 1500$). Social engagement (a cumulative index of social activities), networks consisting of friends, family and children and social support were measured using validated scales. Multiple logistic regressions based on structured inclusion of potentially mediating variables were fitted to estimate the associations between health status and social networks. Self-rated health was better for those with a high level of social integration and a strong network of friends in both locations. In addition, in Hochelaga-Maisonneuve family and children networks were positively associated with good health, though the effect of friend networks was attenuated in the presence of disability, good social support from children was associated with good health. Age, sex and education were included as antecedent variables; smoking, alcohol consumption, exercise, locus of control and depressive symptoms were considered intermediary variables between social networks and health. In conclusion, social networks, integration and support demonstrated unique positive associations with health. The nature of these associations may vary between populations and cultures.

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Introduction

A number of studies have consistently indicated that a lack of social networks predicts mortality from all causes (Avlund, Damsgaard, & Holstein, 1998; Berkman & Syme, 1979; Dalgrad & Häheim, 1998; Dean, Kolody, & Wood, 1990; House, Landis, & Umberson, 1988; Sugisawa, Liang, & Liu, 1994), depression (Krause, Liang, & Gu, 1998; Liang et al., 1999), cognitive decline and dementia (Bassuk, Glass, & Berkman, 1999);

common cold (Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997), poorer function (Mendes de Leon et al., 1999; Unger, McAvay, Bruce, Berkman, & Seeman, 1999) and poor health status (Seeman, 1996). Several pathways directly affecting the immune system, as well as the body's neuroendocrine response to internal or external sources of stress, may account for the effect of social networks on general health status (Stansfeld, 1999).

Berkman et al. have proposed a cascading causal process, ranging from the macrosocial environment to psychobiological processes, through which social relationships influence health (Berkman, Glass, Brissette, & Seeman, 2000). Specifically, they propose the existence of a causal connection, mediated by upstream and downstream factors, between social networks and health. Upstream factors include distal mechanisms

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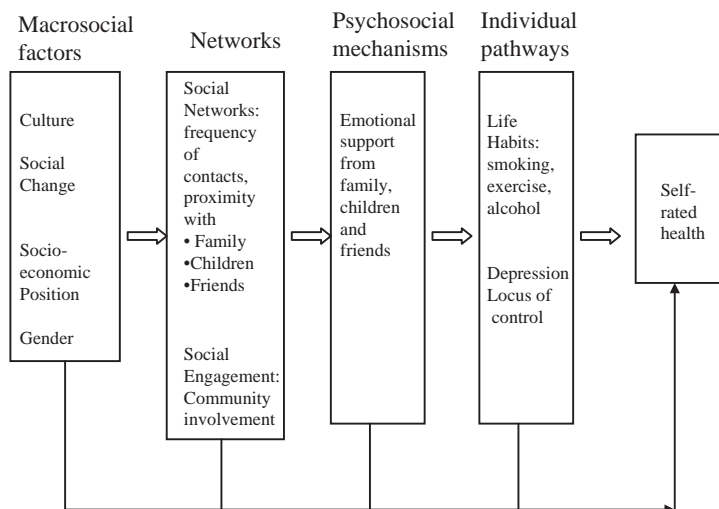
Fig. 1. Social networks and self rated health.

such as socio-cultural and environmental conditions. Downstream factors include psychosocial mechanisms such as social support and access to material resources, as well as other factors more proximate to individual health such as health behavioural, psychological and physiological pathways (Fig. 1).

Berkman's theoretical model (Berkman et al., 2000) allows for the definition of concepts such as social engagement, social networks and social support. Social engagement is defined as community involvement such as belonging to neighbourhood groups, religious groups or non-governmental organizations. Social networks are defined by their structure (number of ties, proximity of relationship) and function (frequency of contact, reciprocity). Networks can be further classified into subnetworks according to the nature or specific role of the relationship in question (friends, relatives, children, spouse). Both the structural characteristics of the network and the nature of the relationships may generate significant yet distinct effects on aging—as proposed by Glass—and these effects explain the relationship between social relations and health status (Glass, Mendes de Leon, Seeman, & Berkman, 1997). Networks may generate support. Social support may be a mediating factor between network ties and health. A network's effect on health may depend, totally or partially on the ability of the network to provide support. Social engagement effects on health may be mediated by psychological mechanisms: being involved in the community where one lives may boost positive feelings about self, feelings of mastery and coherence.

While Berkman's model proposes a general relationship between social networks and health, previous studies have demonstrated that social interaction patterns are culture-specific and vary within cultures

by socio-economic position and gender (Grundy & Slogett, 2003; Turner & Marino, 1994). Thus, they may influence health status differently. The role of social networks and support in the health of the elderly provides an interesting case in point. Thus far, most studies conducted in North America and Northern Europe have focused on community involvement, friendship networks and marital status, while ties to children and extended family have seldom been considered. The few studies, conducted in North America, on the association between the health status of older people and support from their children have indicated that children's support either had no effect or a negative effect on the morale and mental health of their elderly parents (Markides & Krause, 1985; Mutran & Reitzes, 1984; Silverstein & Bengston, 1994). In a recent publication from the Netherlands, the authors find that neither the number of children nor the fact of having children positively affected the experience of aging, while the number of children was associated with negative effects (Steverink, Westerhof, Bode, & Dittmann-Kohli, 2001). The decline in self-esteem associated with loss of autonomy and physical and/or economic dependence may account for these negative effects. In contrast, the literature on minority and poor white populations in the United States (Lawrence, Bennett, & Markides, 1992; Ulbrich & Warheit, 1989), and other countries (Liu, Liang, & Gu, 1995; Zunzunegui, Béland, & Otero, 2001) suggests that support from children has a beneficial effect on the psychological well-being and self-reported health of older parents.

Although the generality of Berkman et al.'s conceptual framework represents a potential strength, a particularly important question concerns the robustness of the model when applied to different social settings or

cultural contexts. We used Berkman et al.'s model to explore the relationship between social networks and self-rated health (SRH) in two French-speaking Canadian populations of community dwelling people aged 65 and over. This comparative approach allows us not only to verify the importance of social networks for health, but also to investigate the possibility that the specific mechanisms whereby social networks impact on health may differ depending on the characteristics of the community. Language, history and socio-economic position have given rise to significant differences in the living environments of the two populations. Hochelaga-Maisonneuve, a neighbourhood of Montreal, is a socio-economically deprived area with a population of 50,000. Moncton is an urban area of 110,000 inhabitants located in the province of New Brunswick. Hochelaga-Maisonneuve is a French-speaking neighbourhood in a bilingual metropolitan area with a French-speaking majority, while in Moncton the French-speaking population constitutes a sizeable minority (36%) in a predominantly English-speaking middle size city. Hochelaga-Maisonneuve is a working class area that has experienced de-industrialisation in the last decade and is in an ongoing state of socio-economic decline. Although Moncton has an industrial history, it developed a diversified economy within which the French-speaking community is well integrated. While Hochelaga-Maisonneuve is located in the greater metropolitan area of Montreal, rural areas and semi-rural communities surround Moncton.

We hypothesized that social integration and social network effects on health would be present in both communities. Moreover, we believed that for both communities, the effect of social networks on health would be mediated at least partly by social support, while psychological pathways would mediate social engagement effects. However, we anticipated that the specific role of community, friends, children and family on health status would differ between the two communities. Specifically, we postulated that in Moncton, with a strong sense of community identity, community involvement would have strong effects on health while in Hochelaga-Maisonneuve, an area with economic decline, family and children networks would have stronger effects.

Methods

Population: Data for this study were taken from two 1995 surveys conducted in the city of Moncton (New Brunswick) and the neighbourhood of Hochelaga-Maisonneuve in the city of Montreal (Quebec).

Sample: In Moncton, a simple random sample of the French-speaking population aged 65 years and over was selected from the enrolee roster of New Brunswick's universal medical drug insurance plan, provided by the

province's Ministry of Health and Social Affairs. Refusal rate was 24.7% of those contacted, while 8.4% were either hospitalized or unable to be located, resulting in a response rate of 66.9% or 1500 subjects. In Hochelaga-Maisonneuve, no comparable list from which to create a sampling frame was available. Instead, households were sampled randomly and one subject older than 65 was selected from each household, resulting in a two-strata sample. The first stratum consists of households with only one older person, and the second stratum, of households with two or more elderly persons. The response rate was 72.5%, 20% refused to participate, 2.8% were hospitalized and 4.7% were unable to be reached after three home visits. In Hochelaga-Maisonneuve, the final sample consisted of 1518 participants.

Data collection: Data on socio-demographic characteristics, history of chronic conditions, functional limitations and cognition, self-perceived health status, disability, depression, patterns of help, household composition, utilisation of health and social services and social integration, networks and support were collected during home visits.

Variables: The health outcome variable was SRH, a valid indicator of health status in North American and other populations (Benyamini & Idler, 1999; Mossey & Shapiro, 1982). It was measured by asking participants to respond to a single question ("How would you rate your health?") by selecting one of five possible responses, "very good," "good," "fair," "poor" and "very poor." Since self-rated-health is a highly skewed variable, subjects were classified into one of two groups (good and very good = 0 vs. fair, poor and very poor = 1).

Social engagement was measured as the sum of four indicators of community involvement: three indicators of activities performed at least monthly (going to church or other place of worship, going to a social centre for the elderly, going to the mall) and one indicator of membership in a community group or organization. The range was 0–4.

Social networks were measured in three areas: friends, extended family and children, using the questionnaire proposed by (Seeman & Berkman, 1988). Components for each type of network were identified using structural equation modelling and the approach proposed by Glass, Mendes de Leon, Seeman, and Berkman (1997). Networks made up of friends and extended family members were quantified by adding together the frequency of visual monthly contact, frequency of telephone contact and proximity. Networks comprised of participants' children were calculated by adding together the frequency of visual monthly contacts, intimacy and proximity. For each field, frequency of visual or telephone contact was scored from 0 (none) to 5 (5 and more/month); "proximity," representing the

distance to the home of the relative living nearest to the participant, ranged from 0 (more than 20 min away) to 4 (same house) and lastly, "intimacy", meaning the number of children with whom the respondent had an intimate relationship, was scored from 0 to 5. Network variables therefore ranged from 0 to 14. Extended family includes siblings, nephews, nieces and cousins. The means for children and friends networks are significantly higher in Moncton than in Hochelaga-Maisonneuve: 7.5 and 7.1 versus 6.2 and 5.5, respectively. Family networks are similar in both communities with a mean value of 6.6.

Social support variables were constructed for each of the above-mentioned fields (children, family, friends), and for the spouse, according to subjects' responses to six questions regarding whether or not they felt loved, listened to, and approved of by relatives, and helpful, important and useful to them. Each response was scored zero if the relationship did not exist (e.g. the person reported not having friends). The four categories of response to each item were scored as follows: -2 = never; -1 = sometimes; 1 = frequently; 2 = always. This scoring system produced 5 categories. Support was defined as the mean value of the responses to the six questions, classified under the same five categories. For the final analysis, the poor and very poor support categories (scores -2 and -1) were grouped together due to the small number of persons that reported very poor support with respect to each relationship. An additional question regarding whether or not the subject had a confidant, a person with whom to talk about intimate matters, was coded as yes or no.

Smoking, alcohol consumption and physical activity were identified as health-damaging or health-promoting behaviours and measured categorically according to history (smoking) or frequency (alcohol, exercise) of exposure.

Among psychological variables that could mediate the influence of social relations on health, locus of control and depression were measured. Locus of control was measured using an internal locus of control scale proposed by Pearlin (Pearlin, Mullan, Semple, & Skaff, 1990). Depressive symptomatology was assessed using the Centre for Epidemiologic Studies Depression Scale (CES-D), a 20-item scale often used in population studies of the elderly. A score of 16 or higher is indicative of depression (Radloff, 1977).

The following potential demographic and socio-economic "upstream" variables were considered: age, gender, education, marital status, and monthly income. Lastly, dependency for Instrumental Activities of Daily Living (IADL) is a possible confounder and/or modifier of the association between social networks and health, in that subjects who are IADL dependent often perceive their health as poorer than subjects who are independent; and those who are dependent may modify the nature of their social networks and activities after onset of disability. Furthermore, IADL dependency may modify the effect of social networks on health. Subjects requiring assistance to carry out at least one of a list of 10 domestic activities were considered IADL dependent.

Statistical analysis

Individuals for whom we were unable to obtain complete data ($n = 437$) in any of the multivariate analyses procedures were compared to those for whom we obtained complete data ($n = 2577$). Most individuals whose data were incomplete did not complete the social support scales, as they were unable to do so. Subjects for whom data were incomplete had poorer SRH, higher levels of IADL dependency, fewer friends, and lower levels of social engagement.

We expected that the associations would vary by location and all analyses were conducted with this in mind. However, since associations between social relations and health are estimated separately for each location, comparisons between them cannot be made.

Bivariate analysis was carried out to identify all variables associated with SRH. Multivariate analyses were based on structured inclusion of potentially mediating variables, as hypothesized in the Berkman model. The initial model comprised age, gender, education and income. These were considered upstream determinants of social networks. Gender was included as a possible modifier at each step of the model-building process, since, according to our hypothesis, gender may alter the nature of the associations between social networks and health. We hypothesized that IADL disability could also be a modifier of the associations between social relations and health since social relations effects on health could be particularly strong among those who are disabled. Therefore, we have tested the interaction terms of IADL disability with all social relations variables.

In the second model, social networks and social engagement were included. In the third model, social support from friends, family, children and spouses were added, leaving in the equation all network variables tested in Model 2, regardless of their statistical significance. As support is only relevant for those with the relationship in question—for example social support from children, for those with children—we have used the method discussed by McDonough and Walters (2001) to estimate the effects of conditionally relevant variables while including all subjects. Essentially, the model compares those with the relational tie (e.g., children) to those without it (e.g., no children) while estimating the effect of support only on those with the tie in question. For example, the effects of children's support on the logit of SRH is estimated as follows: logit $(SRH) = b_0 + b_1$ (Children) $+ b_2$ (Children) (Children's

support). For those who have no children (children = 0), the equation reduces to: logit (SRH) = b_0. Among those who have children (children = 1), the expression becomes: logit (SRH) = $b_0 + (b_1 + b_2$ (children's support)). If the two equations are subtracted, the odds of poor SRH in those with children compared to those without children will depend on the kind of support provided by the children in question, for those who have them. The fourth model included health-related behaviours and the two psychosocial mediators—mastery and depressive symptoms, as variables more proximate to the final health outcome.

At each step, interactions between social relationships, mediating variables, gender and IADL dependency were tested. Because choice of sampling scheme may introduce potential biases, we re-examined these associations using software (SUDAAN) specifically designed to correct for this bias. This analysis produced only small changes in the estimated standard errors of the coefficients in the regression equations. Results reported here were therefore not corrected for the sampling bias.

Results

The bivariate associations between SRH and the socio-cultural variables included in the study are shown in Table 1. As expected, lower education is associated with poor SRH, while very high income is associated with good health. However, men and women seem equally likely to rate their health as poor, and age is not strongly associated with poor health. Those living in Hochelaga-Maisonneuve perceived their health as poorer than those living in Moncton.

Smokers perceived their health as poorer than non-smokers; people who do not drink alcohol report poorer health as compared to those who drink occasionally or daily; people who do not engage in regular exercise report poorer SRH as compared to people who exercise daily or less often (Table 1). IADL dependence is strongly and negatively related to SRH. As expected, low score in the external locus of control, high depressive symptomatology and IADL dependence are strongly negatively related to SRH.

Several measures of social networks are related to health in the direction predicted by the literature. Those with extensive networks report better SRH (Table 2). Poor support from children is associated with poor SRH (Table 3). A lack of friends is strongly associated with poor SRH, while the quality of support provided by friends is not related to health status. Social engagement is closely related to SRH. More than two-thirds of those who report no social activity report poor SRH, while SRH improves as the number of social activities increases. The presence of a confidant or the support

from spouse does not seem to be associated with poor SRH.

Table 4 presents the results from the logistic regression of poor SRH on the variables included in the conceptual framework for the city of Moncton. In Model 1, determinants of social networks are included, representing the macroenvironment in which social networks are situated. As reported in the literature, the very old perceived their health as good or better than younger members of the sample, once disability is taken into account. Women perceived their health as better than men. Those who had not completed primary school considered their health poorer than those who had completed primary school.

Extensive networks of friends are associated with good health while extensive family or children networks do not seem to be associated with SRH. Social engagement activities are associated with health, and the finding that more activity positively affects health persists, after controlling for other risk factors, such as education and disability. Interactions between networks and IADL or gender were insignificant.

To determine the ways in which social networks are associated with health, we included social support. None of the social support variables were statistically significant and previous coefficients remained unchanged. Interactions between support variables and IADL or gender were not statistically significant.

Including health-related behaviours and mental health indicators in the model changed the magnitude of the coefficients in the equation only slightly. Ex-smokers and smokers have poorer health as compared with non-smokers. Those who drink every day report better health than those who drink less often or never. Physical activity is not significantly associated with self-reported health. Locus of control and depression are closely associated with SRH. Fitting a final logistic model to the variables that remained significantly associated with SRH in the last step of the modeling process gives the following results: The estimated OR for no social activities compared with three or more was 1.9; for one activity compared with three or more was 1.5 and there were no differences between those with two activities compared with three or more. An extensive network of friends was associated with good health. The odds of poor health decreased by 20% with each increase of one standard deviation in the friends network scale.

Results for Hochelaga-Maisonneuve are shown in Table 5. SRH is associated with education and there are no important differences between men and women or across age groups. Friend and family networks are associated with good health. However, the association of friends' networks with good health is diminished for those who are disabled.

Table 1
Description of the study samples: Sociodemographic characteristics, life habits and disability

	N		Moncton		Hochelaga	
	Moncton	N Hochelaga	% Poor Health	*p*-value	% Poor Health	*p*-value
Location						
Moncton			36.3			
Hochelaga					41.6	
Age				0.176		0.875
65–74 ans	782	725	34.1		42.5	
75–84 ans	482	393	38.3		39.2	
85 ans et plus	109	86	42.7		44.4	
Sex				0.092		0.478
Men	485	369	38.7		41.1	
Women	888	835	35.1		41.7	
Education				0.001		0.006
Primary and more	1032	806	33.8		39.1	
Incomplete primary	341	398	43.6		46.8	
Marital status				0.160		0.011
Non-married	580	841	33.9		43.4	
Married	792	363	38.2		37.2	
Income				0.310		0.329
<600$	145	180	34.8		47.9	
601–1500$	1083	725	36.2		40.9	
1501–3000$	136	274	40.8		40.0	
>3000$	8	23	9.1		36.4	
Alcohol use				<0.001		<0.001
Never	735	685	42.0		44.2	
Less than daily	600	685	29.9		39.2	
Daily	38	84	26.7		31.8	
Tobacco				0.006		0.001
Non-smoker	623	514	33.8		34.3	
Ex-smoker	585	337	36.3		44.5	
Smoker	165	353	46.0		48.8	
IADL				<0.001		<0.001
Able	1038	882	29.0		34.1	
Unable	335	322	60.7		62.3	

Children's support is significantly associated with health in Hochelaga-Maisonneuve. Those who do not have children and those who receive good support from them report being in better health than those who receive poor or fair support from their children. Extended family, friends and spousal support are not significantly associated with SRH in Hochelaga-Maisonneuve. As in the analysis on the data from Moncton, the inclusion of health-related behaviours and mental health indicators in the model produced slight changes in the magnitude of the coefficients in the equation. Ex-smokers and smokers have poorer health as compared with non-smokers. Locus of control and depression are closely associated with SRH.

The odds of poor health for those without social activities are more than double the odds of poor health for those with three activities or more. Extensive networks of friends, family and children are associated with good health. However, the positive association of having an extensive friends network is attenuated by disability: for those not disabled, a stronger friends network is associated with good health and the odds ratio of poor health associated with an increase of one standard deviation in the

Table 2
Means and standard errors of social networks variables by self-rated health and by city

	Moncton			Hochelaga-Maisonneuve		
	Mean	SD	*p*-value	Mean	SD	*p*-value
Friends networks			<0.001			<0.001
In good health	9.5	4.3		6.7	4.9	
In poor health	8.1	5.1		5.6	5.1	
Children networks			0.167			0.001
In good health	7.5	4.8		6.5	4.5	
In poor health	8.1	4.6		5.7	4.4	
Family networks			0.172			<0.001
In good health	7.0	3.6		5.9	3.8	
In poor health	6.6	3.5		5.0	3.4	

Table 3
Distribution of poor self-rated health by social engagement and social support and by city (total counts and weighted percentages)

	N		Moncton		Hochelaga	
	Moncton	Hochelaga	% Poor health	*p*-value	% Poor health	*p*-value
Social engagement				<0.001		<0.001
None	40	118	70.0		68.0	
One activity	112	377	47.9		49.6	
Two activities	440	381	36.3		34.4	
Three activities	308	190	35.1		31.7	
Four activities	473	138	30.9		30.2	
Friends support				0.002		0.143
Poor	27	28	44.4		33.3	
No friends	157	312	54.0		45.2	
Good	516	758	34.3		39.6	
Very good	673	106	33.1		47.7	
Family support				0.459		0.318
Poor	146	53	37.4		33.3	
No family	47	14	56.0		58.3	
Good	476	586	36.5		42.4	
Very good	704	551	34.7		41.1	
Children support				0.005		<0.001
Poor	13	26	53.3		59.3	
No children	224	238	30.4		46.0	
Good	345	238	43.5		57.1	
Very good	791	769	34.6		36.4	
Spouse support				0.817		0.491
Poor	5	3	28.6			
No spouse	960	512	37.0		42.0	
Good	45	112	38.6		41.8	
Very good	357	576	35.3		41.1	
Confident				0.809		0.681
Yes	1246	968	36.4		41.5	
No	127	235	35.8		42.0	

Table 4
Odds ratio for poor self-rated health estimated with a multivariate logistic regression model in the Moncton sample of people over 65

	Social networks model			Complete model with intermediary variables: Life habits and Psychological mechanisms		
	OR	95% CI		OR	95% CI	
		Lower	Upper		Lower	Upper
Age						
75–84 vs. 65–74	1.00	0.78	1.29	1.05	0.80	1.37
85+ vs. 65–74	0.79	0.50	1.25	0.84	0.52	1.35
Sex						
Women vs. men	0.75	0.59	0.96	0.79	0.60	1.05
Education						
Incomplete primary vs. complete	1.32	1.01	1.73	1.16	0.87	1.54
Disability						
Disable vs. Able	3.48	2.64	4.59	3.00	2.24	4.03
Social activities						
None vs. three or more	1.91	0.92	3.99	1.61	0.74	3.53
One vs. three or more	1.51	0.99	2.32	1.31	0.84	2.06
Two vs. three or more	0.85	0.66	1.11	0.80	0.61	1.06
Friends networks	0.96	0.93	0.98	0.97	0.94	1.00
Family networks	1.00	0.97	1.03			
Children networks	1.01	0.98	1.03			
Smoking						
Ex smoker vs. never smoked				1.36	1.03	1.81
Smoker vs. never smoked				1.73	1.15	2.60
Alcohol use						
Never				2.68	1.13	6.34
Less than daily				1.75	0.74	4.14
CES-D						
High depressive symptoms				2.85	1.71	4.74
Locus of control						
Medium vs. high				1.04	0.74	1.44
Low vs. high				2.37	1.79	3.15

friends network is 0.82 (95% CI = 0.67; 0.99). Among those with disability, the effect of the same increase of one standard deviation in the friends network becomes negligible (OR = 1.02, 95% CI = 0.97; 1.07). The association of the children's network with health is partly mediated by support received from children. Those who have children and do not have a very good relationship with them have higher odds of poor health than those without children or those who receive good support from their children (OR = 1.52; 95% CI = 0.92; 2.51, after inclusion of intermediary variables).

Discussion

Social networks are associated in a unique way with health; however, the specific nature of the associations between social networks and health varies according to social context. In a deprived context that has undergone social change and de-industrialization, with material insecurity and low educational resources, networks consisting of children seem to play an important role. Within a middle class population in a city with high social cohesion and a strong sense of community, friends may be the most important relational ties with respect to

Table 5
Odds ratios for poor self-rated health estimated with a multivariate logistic regression model in the Hochelaga Maisonneuve sample of people over 65.

	Social networks model			Social support model			Life habits and psychological mechanisms model		
	OR	95% CI		OR	95% CI		OR	95% CI	
		Lower	Upper		Lower	Upper		Lower	Upper
Age									
75–84 vs. 65–74	0.74	0.56	0.97	0.74	0.56	0.97	0.76	0.57	1.02
85+ vs. 65–74	0.55	0.33	0.92	0.55	0.33	0.92	0.68	0.39	1.19
Sex									
Women vs. men	1.16	0.88	1.52	1.16	0.88	1.52	1.23	0.91	1.65
Education									
Incomplete primary vs. complete	1.25	0.96	1.62	1.25	0.96	1.62	1.24	0.94	1.63
Social activities									
None vs. three or more	3.06	1.84	5.07	3.06	1.84	5.07	2.25	1.29	3.90
One vs. three or more	1.73	1.25	2.40	1.73	1.25	2.40	1.53	1.08	2.17
Two vs. three or more	0.93	0.67	1.30	0.93	0.67	1.30	0.89	0.63	1.25
Family networks	0.96	0.93	0.99	0.96	0.93	1.00	0.97	0.94	1.01
Children networks	0.94	0.91	0.97	0.95	0.91	0.98	0.96	0.92	1.00
Friends networks by IADL disability									
Among IADL Disabled	1.06	0.96	1.12	1.06	0.96	1.12	1.02	0.97	1.07
Among not IADL disabled	0.82	0.68	0.97	0.82	0.67	0.99	0.82	0.67	0.99
Children dummy indicator				1.20	0.38	3.80	1.28	0.38	4.26
Children's support									
Poor vs. no children				1.74	1.08	2.82	1.52	0.92	2.51
Good vs. no children				0.87	0.55	1.37	0.93	0.58	1.48
Smoking									
Ex smoker vs. never smoked							1.55	1.11	2.15
Smoker vs. never smoked							1.57	1.13	2.18
Locus of control									
Medium vs. high							1.32	0..95	1.85
Low vs. high							2.14	1.55	2.96
CES-D									
High depressive symptoms							2.51	1.70	3.72

the promotion of health. In both communities, community involvement, as reflected by the number of activities in which subjects participate, is positively associated with good health.

The association between social networks and SRH does not appear to be affected by gender, at least in this Canadian sample. These findings differ from those observed in other societies, where gender roles may be more pronounced. The association between social networks and health does not depend generally on the presence of IADL dependency, suggesting that the effects of networks do not depend on IADL ability.

Our results provide empirical support for the conceptual model proposed by Berkman et al. Although the

specific mechanisms whereby social networks impact on health vary between Hochelaga-Maisonneuve and Moncton, the associations found in our study correspond well to the general pathways described by Berkman et al. As predicted by their model, we found that the association between social networks and SRH in both communities were partially mediated by social support, life habits and psychological mechanisms.

Alternative explanations for the observed associations are possible. First, given the cross-sectional nature of the design of the studies, it is quite plausible that poor health would limit community involvement and would reduce the frequency of contacts with friends, family and children. Additionally, SRH is a multidimensional

summary measure of different domains of health. Therefore the concept of SRH encompasses psychological characteristics and disability. For example, indicators of psychological characteristics can overlap with those included by respondents in their self-ratings of health and we may interpret this association as causal when in fact, it is conceptual.

Comparison of these results with those from a Spanish study carried out in 1993 using the same questionnaire (Zunzunegui et al., 2001) provides additional insight into our findings. Analysis of the data from Spain indicates that networks consisting of friends were not uniquely associated with SRH or depressive symptoms, while networks consisting of participants' children, support provided by these children, and, to a lesser extent, extended family contacts, were positively and strongly associated with health. Significant social differences between the Spanish and Canadian samples make further comparisons difficult. Three main differences require special mention. First, the nature of the community-dwelling elderly may be substantially different. In Spain, only 2.3% of people over 65 live in institutions (nursing homes, homes for the aged, etc.) compared to approximately 8.24% Canadians (Carriere & Pelletier, 1995). Second, in the Spanish sample, 46% of subjects with children share living arrangements with them, and co-residence increases after 85 years of age to 76%. Almost 50% of the Spanish sample reported to have no friends, illustrating to which point social life is centred on family for this generation of older adults in Spain. In the Canadian sample comprising data from Moncton and Hochelaga-Maisonneuve, only 23% of those with children co-reside with them and cohabitation increases slightly to 30% for those over 85. Only 22% reported having no friends. Third, only 20% of the Spanish sample had completed 4 yr of primary education while 80% of the Canadian sample had completed primary school, reflecting the lack of access to formal education in the first half of the 20th century in Spain.

The gender-related differences in self-perceived health and depressive symptoms observed in Spain are commonly observed in societies with greater gender stratification (Encuesta Nacional de Sanidad, 1993; Mas vale por viejo, 2002; Zimmer, Natividad, Lin, & Chavoyan, 2000; Zunzunegui, Béland, & Llacer, 1998). In the Canadian sample, as observed in other studies conducted in North America and Northern Europe, there are no significant gender differences in SRH or depressive symptoms (Levasseur, 2000; Jylha, Guralnik, Ferrucci, Jokela, & Heikkinen, 1998). These observations support the view that gender-related differences in SRH may be related to both gender-based differential exposures (i.e. to life events and chronic stress) and differential vulnerability (social disadvantage and lack of resources leading to increased reactivity) (McDonough & Walters, 2001). Therefore, in societies where exposure and vulnerability are clearly divided along gender lines, we would expect to observe greater gender-related health differences than in countries where gender roles are less sharply defined.

Qualitative distinctions between the two Canadian communities are useful in the interpretation of our own results, according to which friends are more conducive to good health in Moncton, while children are more important in Hochelaga-Maisonneuve. Older people in the French-speaking community of Moncton differ significantly from older people living in the Montreal neighbourhood of Hochelaga-Maisonneuve, as indicated by the results of a qualitative study to describe both communities based on key informants of different ages (Martin, 1997). Community dimensions included socio-demographic development, language and culture, economy, mutual aid, community life, social cohesion, family, sense of belonging and local identity, and relationships with the outside world. The interviews were centred on the role and reactions of older people with respect to these issues, whose importance varied by community. In Monkton, community life is the most salient issue (community leadership and organizations), followed by language and cultural issues. In Hochelaga-Maisonneuve, economic decline and mutual aid to help cope with poverty are clearly the most important issues, followed by sense of belonging, while language and cultural issues appear very seldom in the discourse. Older people are associated with discourse on mutual aid and family in both cities but in Hochelaga-Maisonneuve, links between family and older people appear in more than half of the interview excerpts, followed by mutual aid to a lesser extent by far. The social activity of older people is often limited to the private sphere and while families are the main source of support, they are referred to more often in Hochelaga-Maisonneuve than in Moncton. Community life (schools, churches, municipal activities and leisure-time activities) is the subject of more focus in the middle class population of Moncton, while mutual aid and the family are the salient issues in the deprived urban area of Hochelaga-Maisonneuve. However, it may well be that isolation and social exclusion of older people increase when families are stricken with poverty and social disintegration, as is probably the case in Hochelaga-Maisonneuve, with the net result that family support is insufficient to counterbalance the effects of material and social vulnerability.

To summarize, the nature of the associations between social relationships and health seem to vary in the two communities. While both populations appear to enjoy beneficial effects from social activity in the community, children are more important in Hochelaga-Maisonneuve than in Moncton. In contrast, networks consisting of friends seem to be associated with good health in the two French-speaking Canadian populations.

Contrasting the mediating and the moderating hypothesis on the role of social relations in the link between education and health, Antonucci et al. report that the health of men with little education improves with social support from their children (Antonucci, Ajrouch, & Janevic, 2003). They conclude that children's support has a more important effect in the presence of chronic stressors associated with low education, than in the absence of these chronic stressors. This conclusion is supported by our own findings: children's networks seem to be more salient in the more socially and materially deprived area of Hochelaga-Maisonneuve than in the more affluent and cohesive environment of Moncton. In addition to economic and social differences, there are cultural differences that may change the associations between networks and health. In particular, there are important differences in the value of family interdependence between Northern Europe and North America as compared to Southern Europe. In Spain, filial obligation is a strong value and breaking the intergenerational contract of support has consequences for the physical and mental health of older adults. McIntyre et al. have proposed a conceptual explanation for geographical variations in health, based on aspects of collective functioning, i.e.: "aspects of collective, shared, social functioning such as ethnic, regional or national identity, religious affiliation, political ideologies and practise, legal and fiscal systems, shared histories, kinship systems, domestic division of labour, gender, age, and caste appropriate roles may explain area differences in health…beyond the characteristics of individuals concentrated in particular places" (McIntyre, Ellaway & Cummins, 2002).

Strengths and limitations: The main limitation of the current study is its cross-sectional nature. A longitudinal design is needed to establish the risk of poor health for those older people who are socially isolated or have poor social networks. A second limitation is the selection bias that may be present due to the response rate (69% in Moncton, 72.5% in Hochelaga-Maisonneuve). These response rates are similar to those of other studies conducted with older adult participants in Canada (Marshall, 1987), and are nearly identical to the 72% reported recently by the Canadian Health Study on Aging (Helliwell, Aylesworth, McDowell, Baumgarten, & Sykes, 2001).

As to the strengths of this work, our results are based on a large sample size taken from two North American communities with significant differences in material infrastructures and social functioning, and social relationship measurements were based on a theoretical model that proved to be valid for the elderly (Berkman et al., 2000), capturing three dimensions of network structure (ties, support and engagement) and the role-specificity of each. Previous research indicates that these three dimensions, as well as the type of social relation-

ship involved, have a differential impact on health outcomes (Stansfeld, 1999), and this study indicates similar associations with SRH.

The magnitudes of the associations in this study are comparable to the magnitude of associations of biological and behavioural risk factors for poor health. Moreover, social integration and networks may represent variables that are amenable to policy interventions. Future research on the effect of social relationships on health should continue with longitudinal designs integrating both populations with diverse specific collective social functioning (upstream factors in Berkman's model) and biomarkers of neuroendocrine and immunologic function (downstream factors). If results are confirmed by longitudinal research, they will provide evidence for the importance of intergenerational family relationships, friends and community involvement to the physical and mental health of older people.

5. Uncited reference

Litwin (1998).

Acknowledgements

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